EATING DISORDER DIAGNOSIS AND THE FEMALE ATHLETE:

FROM COLLEGE SPORT TO RETIREMENT

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Female athletes have been established as a high-risk group for disordered eating due to the high prevalence rates of clinical (i.e., 1.9% to 19.9%) and subclinical eating disorders (i.e., 7.1% to 49.2%). To date, only a few studies have examined the long-term stability of eating disorders in collegiate female athletes, a design that will allow examination of change in prevalence rates over time. Additionally, researchers have attempted to identify psychosocial risk factors in the development of disordered eating, but short time frames (e.g., competitive season, one year) during which data was collected have limited their findings. The current study investigated the progression in prevalence of eating disorder classification (i.e., eating disordered [ED], subclinical ED, asymptomatic), pathogenic weight control behaviors (e.g., laxative use, vomiting), and the predictive ability of psychosocial risk factors (e.g., body dissatisfaction, negative affect) from the time in which female athletes were active collegiate competitors (Time 1) to a time six years later, in which the women were retired (Time 2). By Time 2, the women were categorized as asymptomatic (69.9%), subclinical ED (26.9%), and clinical ED (3.1%). The prevalence of those who were disordered (i.e., either subclinical or clinical ED) increased from 22.8% (Time 1) to 30.1% (Time 2). The athletes, both as active competitors and retired, reported using exercise and dieting/fasting as the most frequent forms of weight control, but to a much lesser degree when retired. The full model explained 14.9% to 21.1% of the variance in disordered eating categories, and correctly classified 73.6% of the athletes in the sample. Dietary intent and sadness significantly predicted their being classified in the disordered eating group. Early intervention efforts that address eating, body image concerns, proper nutrition, and how to

eat healthfully when athletes are competing are important and may help to alleviate future distress. Additional clinical implications and limitations are discussed.

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CHAPTER 1

INTRODUCTION

Eating disorders (EDs) represent severe disturbances that typically include acute misperceptions and concerns about body shape and weight and disruptions in normal, healthy eating patterns. EDs warrant particular attention from researchers and clinicians due to their association with a variety of psychological and physiological co-morbidities (e.g., anxiety, electrolyte imbalance; Treasure, Claudino, & Zucker, 2010), high prevalence among girls and women (Hudson, Hiripi, Pope Jr., & Kessler, 2012), high mortality rate (Smink, van Hoeken, & Hoek, 2012), and extensive care required in treatment (Treasure et al., 2010). Female athletes have been identified as a high-risk group for EDs because of the unique pressures in the sport environment about weight, eating, body shape, appearance, and performance that emanate from coaches, teammates, and other sport personnel (Petrie & Greenleaf, 2012). Initial prevalence research supports the fact that female athletes do suffer from EDs (e.g., Beals & Manore, 2002; Carter & Rudd, 2005; Greenleaf, Petrie, Carter, & Reel, 2009; Sanford-Martens, Davidson, Yakushko, Martens, Hinton, & Beck, 2005), though most studies have been cross-sectional, which limits their ability to determine how EDs might change over time in sport environments. Of the few longitudinal studies (e.g., Doughty & Hausenblas, 2005; Krentz & Warschburger, 2013; Thompson, Anderson, & Petrie, 2017), all have examined changes in ED prevalence over a specific sport season or while the athletes were active participants in their sport. Thus, data on the prevalence of EDs among retired athletes, particularly changes that might occur as athletes move into retirement, is lacking.

Prevalence of EDs among Female Athletes

A primary reason female athletes have been identified as at-risk for the development of

EDs is the unique pressures in the sport environment regarding weight, body shape, appearance, and diet (Petrie & Greenleaf, 2012). Specifically, these pressures can include weight limits, judging criteria that reinforce certain body shapes, publically conducted weigh-ins, stereotypical performance ideals (e.g., thin physique for long-distance runners), revealing uniforms, pressures to attain a certain physique, modeling of ED behaviors by other athletes, competition environments inundated with competitive personalities, and self-weighing (Arthur-Cameselle & Quartromoni, 2010; Carrigan, Petrie, & Anderson, 2015; Thompson & Sherman, 2010). Athletes also cope with the stress of performing in front of audiences, physical training loads that vary throughout the year (i.e., in-season vs. off-season), and balancing the demands of being a student-athlete. Over time and with consistent exposure to such pressures, athletes may become dissatisfied with their body size and shape and unhappy with themselves in general, and engage in behaviors to compensate, such as restricting caloric intake, that may increase their risk of developing an ED.

ED prevalence is generally divided into rates that either represent clinical (i.e., meets diagnostic criteria for an ED, such as Anorexia Nervosa [AN] or Bulimia Nervosa [BN]), or subclinical (i.e., presence of ED symptoms that do not meet full criteria for one of the clinical disorders due to lesser frequency or intensity of symptoms [e.g., behavioral bulimia]) levels. Based on cross-sectional methodologies, prevalence of clinical and subclinical EDs among female athletes has ranged from 2.0% to 19.9% and 7.1% to 49.2%, respectively (e.g., Greenleaf et al., 2009; Reinking & Alexander, 2005; Soubliere & Gitimu, 2012; Torstveit, Rosenvinge, & Sundgot-Borgen, 2008). With female elite athletes, researchers have reported rates of 1.9% to 4.8% for AN, 6.3% to 8.1% BN, and 7.8% to 19.9% for ED Not Otherwise Specified (EDNOS; Sundgot-Borgen, 1993; Sundgot-Borgen & Torstveit, 2004; Torstveit et al., 2008). Collegiate

athletes appear to meet criteria for EDNOS most often (Anderson & Petrie, 2012; Carter & Rudd, 2005; Greenleaf et al., 2009; Petrie, Greenleaf, Reel, & Carter 2009a). In several large, multi-sport samples of female athletes (Greenleaf et al., 2009; Petrie, et. al, 2009a), rates of EDNOS ranged from 2.0% to 5.7%; none met criteria for AN and only one (0.2%) met criteria for BN.

Female athletes more commonly engage in binge eating and certain individual weight control behaviors than the sets of behaviors/symptoms needed for clinical diagnoses (Greenleaf et al., 2009; Martinsen, Bratland-Sanda, Eriksson, & Sundgot-Borgen, 2010). For example, in a study of NCAA D-I female collegiate athletes from 17 different sports (e.g., gymnastics, tennis, cross country, volleyball), Greenleaf et al. (2009) found that the athletes primarily used dieting/fasting (15.7%; at least twice in the last year) and exercising (25.5%; at least 2 hours/day to burn calories); they rarely resorted to vomiting (2.9%), diuretics (1.5%) or laxatives (1.0%). Similarly, among female athletes from 15 different sports (e.g., gymnastics, basketball, softball), 67% reported limiting food choices (e.g., eliminate red meat, restrict fats and/or carbohydrates), 42% purposely restricted food intake to control weight, 11% fasted, 15% maintained low-calorie diets, 4% used laxatives, 8% used diet pills, and 7% vomited to control weight (Beals & Manore, 2002). Athletes' use of dieting and exercising, as opposed to more extreme weight-control measures (e.g., vomiting, diuretic/laxative misuse), often is easier to hide within the sport environment.

Researchers recently have begun to employ longitudinal designs to determine the prevalence of EDs with female athletes (Martinsen et al., 2014; Sungot-Borgen & Torstveit, 2010; Thompson et al., 2017). For example, Sundgot-Borgen and Torstveit (2010) examined existing data from comparable samples of female elite athletes between 1990 and 2002, and

found prevalence rates of athletes with clinical and subclinical EDs ranged from 20.0% to 28.1%, and 21.2% to 60.1%, respectively. Although their findings suggest an overall increase over an eleven-year period, they did not follow the same sample over time and their definitions of being at-risk for an ED varied at each data collection. Within a large sample of female collegiate athletes, Thompson et al. (2017) found that prevalence rates for clinical EDs increased (6.2% to 7.4%), but subclinical rates decreased (25.5% to 15.7%), over the course of their five-month competitive seasons. Additionally, the percentage of athletes who endorsed dieting (12.3% to 9.2%) and exercising to burn calories (42.5% to 35.4%) decreased from beginning to end of their seasons. In a study of elite female adolescent athletes (Martinsen et al., 2014) conducted over a two-year time period, the prevalence of clinical EDs in the control group increased from 15.3% to 20.8%, which included new cases of EDs from athletes who were either "healthy" (i.e., did not meet risk or ED classification) or subclinical at the beginning of the study. Although some pathogenic weight control behaviors seem to decrease over time, without intervention, rates of EDs may increase. What is not known from these studies, however, is how EDs and their related behaviors may progress as athletes move from competitive sport into retirement.

Transitioning out of sport represents a potentially significant stressor for athletes and qualitative research has indicated that retired athletes, particularly female, may struggle with body image and eating concerns (Kerr & Dacyshyn, 2000; Papathomas & Lavallee, 2014; Stirling, Cruz, & Kerr, 2012; Warriner & Lavallee, 2008). For example, Kerr and Dacyshyn (2000) interviewed seven retired elite (i.e., national- and international-level) female gymnasts about their experiences. The women acknowledged preoccupation with body/appearance throughout their time as competitors, and continued body dissatisfaction and self-monitoring

upon retirement; two women indicated their concern with weight worsened in retirement. Stirling et al. (2012) interviewed eight retired elite gymnasts about their body satisfaction and use of weight control behaviors. All of the gymnasts described distressing changes in body composition, including weight gain, loss of "competition body," and loss of muscle mass and physical strength. None reported having a current clinical ED, but the majority (n = 7) employed weight control behaviors because of their increased body dissatisfaction, including food restriction (n = 6), calorie counting (n = 3), laxatives or diet pill misuse (n = 4), and excessive exercising (n = 7). These athletes' experiences suggest that weight and appearance pressures from the sport environment do not immediately remit upon retirement and may carry forward, continuing to cause distress.

These qualitative investigations have offered a rich description of the development, and progression, of disordered eating attitudes and behaviors (during and after sport participation has ended). Though they suggest that athletes experience disturbances in eating behaviors both during active sport competition and following career termination, and that eating behaviors can worsen at the onset of sport retirement, they are limited in generalizability and replicability (Papathomas & Lavallee, 2006). Further, in these studies, the researchers did not conduct any diagnostic testing and only single athletes or a limited number of participants from the same sport were examined (e.g., Papathomas & Lavallee, 2014; Stirling et al., 2012). Research is needed to quantitatively examine ED diagnoses among competitive athletes as they move into retirement to determine if classification changes as they leave the sport environment.

The few longitudinal ED studies of athletes were conducted only while they were active competitors (e.g., Martinsen et al., 2014; Sundgot-Borgen & Torstveit, 2010), and could not address the influence of sport retirement. Therefore, my first purpose was to investigate the

prevalence of ED classifications (i.e., clinical ED, subclinical ED, and asymptomatic/healthy eating) and pathogenic weight control behaviors (i.e., bingeing, vomiting, laxative use, diuretic use, dieting, and excessive exercise) in retired female collegiate gymnasts and swimmers/divers across two time points – the end of their competitive seasons (Time 1) and 6 years later following retirement from their collegiate sport careers (Time 2). Because Time 1 prevalence data have been presented (Thompson et al., 2017), this study focused on data from Time 2, using Time 1 as the comparison. Based on existing research (e.g., Holland, Boddell, & Keel, 2013; Thompson et al., 2017), I hypothesized that, over time, (1) prevalence rates for the clinical ED group would increase slightly, (2) prevalence rates for the subclinical group would decrease, and (3) prevalence rates of pathogenic weight control behaviors (i.e., binging, vomiting, laxatives, diuretics, fasting, excessive exercise) would decrease.

Psychosocial Predictors of EDs among Female Athletes

In addition to the pressures about weight and body that exist in the sport environment, Petrie and Greenleaf (2012) identified other psychosocial factors, including dietary intent, body dissatisfaction, negative affect (e.g., sadness, guilt), general societal pressures about appearance and weight, and internalization of societal appearance ideals, which they believed interacted to increase athletes' risk of developing clinical and subclinical EDs. Cross-sectional studies have provided initial support for many of these proposed risk factors (Anderson, Petrie, & Neumann, 2011; Greenleaf, Petrie, Reel, & Carter, 2010; Petrie et al., 2009a; Petrie et al., 2009b; Voelker, Gould, & Reel, 2014). For example, Petrie et al. (2009a) found that female collegiate athletes who were classified as either having a subclinical or clinical ED, versus those who were asymptomatic, scored significantly higher (and more pathologically) on measures of perceived pressures about weight and body size/shape, negative mood (e.g., sadness), internalization of

sociocultural values about appearance, and body dissatisfaction. In a related study, Voelker et al. (2014) found that being self-conscious about weight and appearance, general body dissatisfaction, and sport-specific body dissatisfaction were significant predictors of disordered eating scores on the EAT-26.

Although fewer in number, longitudinal studies have affirmed that many of these variables do indeed increase female athletes' risk (Anderson, Petrie, & Neumann, 2012; Doughty & Hausenblas, 2005; Krentz & Warschburger, 2013; Voelker, Petrie, Neumann, & Anderson, 2016). For example, Anderson et al. (2012) examined the cross time-lagged relations among sport pressures to achieve a certain body shape, body satisfaction, and intent to diet or restrict food between the beginning and end of a six-month competitive season. Controlling for all Time 1 scores, they found that the sport pressures athletes reported at Time 1 predicted decreases in their Time 2 body satisfaction ($\beta = -.26$, $p < .01$). No other variables had any effects from Time 1 to Time 2. Over the course of a year, Krentz and Warschburger (2013) found that elite German female athletes' reported desires to be leaner to improve their sport predicted their level of disordered eating at the end of the year, even after controlling for disordered eating at Time 1. In a sample of female collegiate athletes, their Time 1 (at the beginning of the competitive season) negative affect, body satisfaction, and dietary intent scores were unrelated to their Time 2 (end of season) bulimic symptomatology (Voelker et al., 2016). However, even after controlling for Time 1 scores in the outcome variable, Time 1 negative affect ($\beta = - 0.12$, $p < .05$) predicted decreases in Time 2 dietary restraint, Time 1 bulimic symptomatology ($\beta = -0.19$, $p < .01$) predicted decreases in Time 2 body satisfaction, and Time 1 body satisfaction ($\beta = -0.23$, $p < .01$) predicted decreases in Time 2 negative affect.

The results of these studies suggest that psychosocial variables, such as body dissatisfaction, perceived pressures about body and weight (particularly within the sport environment), negative affect, and dietary restraint, are related to disordered eating symptoms when athletes are actively competing. Thus, consistent exposure to sport pressures may increase vulnerability to the onset of ED behaviors or their maintenance as long as athletes remain in the sport environment. What is not known, however, is what occurs when athletes retire and are not subject to sport pressures on a daily basis, and to what extent the psychosocial variables that existed when competing influence ED classification in retirement. Research is needed that gathers data about the aforementioned psychosocial variables when athletes are actively competing, and that follows them longitudinally to gather information about their eating behaviors in retirement.

Thus, my second purpose was to examine the longitudinal relations of body dissatisfaction, negative affect, thin-ideal internalization, dietary restraint, and perceived general sociocultural pressures at the end of a competitive sport season in relation to ED classification six years later, when the athletes were retired from their sports. I hypothesized that higher levels of body dissatisfaction, negative affect, internalization, dietary restraint, and pressures for weight loss, exercising, being more attractive, and changing appearance would contribute significantly to the athletes being classified in the subclinical/clinical ED group.

CHAPTER 2

METHOD

Participants

Participants included 193 retired NCAA Division I female athletes (gymnasts = 122; swimmers/divers = 71) who were drawn from 26 different programs. Mean age was 25.75 years (*SD* = 1.19; range = 24 to 29 years) at Time 2. In terms of racial/ethnic group status, 171 (88.6%) were White/Caucasian, 7 (3.6%) Black/African American, 1 (0.5%) Hawaiian/Pacific Islander, 8 (4.1%) Asian American, 4 (2.1%) biracial, and 2 (1.0%) who identified as "other." Of the participants, 46 (23.8%) reported they were single, 103 (53.4%) reported they were in a romantic relationship, 42 (21.8%) were married, and 2 (1.0%) were divorced. Graduation years ranged from 2007 to 2016, with the majority (*n* = 181, 93.8%) graduating between the years 2009 and 2013. Based on their body mass indexes (BMI; Centers for Disease Control and Prevention [CDC; n.d.]) the athletes were: underweight (BMI < 18.5: Time 1, *n* = 3, 1.6%; Time 2, *n* = 5, 2.6%), normal weight (BMI 18.5-24.99: Time 1, *n* = 170, 88.1%; Time 2, *n* = 165, 85.5%), or overweight (BMI > 25: Time 1, *n* = 20, 10.4%; Time 2, *n* = 23, 11.9%). Participants' mean BMI was 22.64 kg/m^2 (*SD* = 2.06; Time 1) and 22.32 kg/m^2 (*SD* = 2.81; Time 2).

Instruments

Demographics

The athletes provided general demographic material, including information such as age, race/ethnicity, relationship status, height, and weight.

Disordered Eating

The Questionnaire for Eating Disorder Diagnoses (QEDD; Mintz, O' Halloran, Mulholland, & Schneider, 1997) is a 50-item self-report measure whose responses were used to

classify the athletes based on criteria from the *DSM-4-TR* (APA, 2000) as: (1) clinical ED (i.e., anorexia nervosa, bulimia nervosa, or eating disorder not otherwise specified [ED-NOS], which includes menstruating anorexia, subthreshold bulimia, nonbinging bulimia, and binge-eating disorder), (2) subclinical ED (i.e., demonstrates symptoms of disordered eating but does not meet criteria for a diagnosis), and (3) asymptomatic according to the criteria stipulated by the measure. Research has shown the QEDD is a reliable tool that has demonstrated one to three month test-retest reliabilities, with kappa values ranging from .54 to .85, for clinical ED, subclinical ED, and asymptomatic groups (Mintz et al). Additionally, the authors found an accuracy rate of 98% between the QEDD and clinician diagnoses of ED categories. Further, studies have demonstrated its utility in classifying female athletes with a clinical ED, subclinical ED, and asymptomatic (Carter & Rudd, 2005; Greenleaf et al., 2009; Sanford Martens et al., 2005).

Weight Control Behaviors

Seven items from the 36-item Bulimia Test-Revised (BULIT-R; Thelen, Mintz, & Vander Wal, 1996) were used to asses the frequency and duration in which the athletes have participated in binge eating, and the frequency with which they have used each of the following weight control methods: laxatives, exercising to lose weight, vomiting, dieting/fasting, and diuretics. For each item, such as, "I exercise in order to burn calories," athletes responded on a 5-point scale that ranged from 1 (*least frequent use*) to 5 (*most frequent use;* the scale indicating the frequency of each behavior varied slightly). These items have been used in previous research with female collegiate athletes to assess frequency of weight control behaviors (e.g., Greenleaf et al., 2009; Voelker et al., 2016).

Body Satisfaction

The 12-item Body Parts Satisfaction Scale-Revised (BPSS-R; Petrie, Tripp, & Harvey, 2002) assesses satisfaction through ratings of different body parts (e.g., hair, overall face, upper thighs). Items load on two factors (Body – seven items; Face – four items) and one item provides an assessment of overall satisfaction with body and muscle tone. The women rated their satisfaction over the past three months on a scale that ranged from 1 (*extremely dissatisfied)* to 6 (*extremely satisfied*). The total score for each of the factors is the mean of the respective items; higher scores indicate greater satisfaction. Petrie et al. (2009a) reported Cronbach's alphas of .90 and .73 for body and face, respectively, in a mixed-sport sample of female collegiate athletes; alphas for the current study were .90 and .75, respectively. Petrie et al. (2002) has provided extensive information about the scale's construct validity. The two factors (i.e., Body, Face) were employed for the current study; the single item assessment of overall satisfaction was removed due to high correlation among the variables.

Negative Affect

Participants completed 23 items from the Positive and Negative Affective Schedule-Extended version (PANAS-X; Watson & Clark, 1992), which assessed the extent to which they experienced various emotions (e.g., fear, anger, guilt) on average over the previous three months. The women rated their experience of emotions on a 5-point Likert scale, ranging from 1 (*very slightly/not at all*) to 5 (*extremely).* A mean total score was derived for each affective state; higher scores indicate stronger negative mood. The PANAS-X has been shown to be a valid and reliable measure of negative affect, showing convergence with the Profile of Mood States (POMS) ranging from .85 to .91 and two-month test-retest reliabilities ranging from .64 to .71 (Watson & Clark, 1992). Tylka and Wilcox (2006) reported Cronbach's alpha of .87 with a

sample of female undergraduate students; alphas for the current study ranged from .85 to .93. It has previously been applied with female athletes to evaluate general mood states (e.g., Anderson et al., 2011; Voelker et al., 2016).

Internalization

The 14-item Sociocultural Attitudes toward Appearance Questionnaire-3 (SATAQ-3; Thompson, van den Berg, Roehrig, Guarda, & Heinberg, 2004) assesses general and athlete specific aspects of internalization of messages about beauty, attractiveness, and body size/shape and messages related to an ideal athletic appearance, respectively. For each item, such as, "I care if my body looks like the people on TV and in the movies," the women responded on a scale that ranged from 1 (*definitely disagree*) to 5 (*definitely agree).* Total score for each factor is the mean of those items; higher scores indicate greater internalization of those appearance ideals. Warren, Gleaves, and Rahkovskaya (2013) reported Cronbach's alphas ranging from .96 to .98 and .89 to .99 for the general and athletic subscales, respectively, in a sample of diverse American university women separated by ethnicity; alphas for the current study were .91 and .81, respectively. Thompson et al. (2004) provided support for the scales' validity by reporting correlations with Eating Disorder Inventory subscales that ranged from .17 to .55. These scales have been used in past research of female athletes to measure internalization (e.g., Anderson et al., 2011).

Dietary Restraint

The 9-item Dietary Intent Scale (DIS; Stice, 1998) measures restricted eating patterns and dieting behavior. On items such as, "I take small helpings in an effort to control my weight," the women responded from 1 (*never*) to 5 (*always).* Total score is the mean of the items; higher scores indicate greater intention to restrict eating. Previous studies with female athletes have

employed the DIS (e.g., Anderson et al., 2011; Carrigan et al., 2015; Voelker et al., 2016). In a study with female adolescents (Greenleaf, Petrie, & Martin, 2015) Cronbach's alpha was .91; alpha from the current study was .93. Stice and Shaw (1994) reported a significant correlation (r = .92) with the Dutch Restrained Eating Scale (DRES).

Perceived Pressures

The participants completed the 35-item Perceived Sociocultural Pressures Scale (PSPS; Stice & Agras, 1998), a self-report measure that assesses the pressures experienced to (1) lose weight, (2) have a thin body, (3) exercise, (4) be more attractive, (5) have the perfect body, (6) diet, and (7) change one's appearance. Within each domain (e.g., "I've felt pressure to lose weight or diet from my…"), participants used a scale that ranged from 1 (*never*) to 5 (*always*) to rate the pressure they experience from four different sources: female friends, family, teammates/coaches, and the media. Total score for each type of pressure is the mean of the four sources; higher scores indicate more pressure. Research with NCAA athletes has employed the PSPS (Anderson et al., 2011), and a Cronbach's alpha of .90 was found in a study of female adolescents (Greenleaf et al., 2015). Alphas from the current study were .79 (lose weight), .79 (thin body), .84 (exercise), .88 (more attractive), .85 (perfect body), .86 (diet), and .89 (change appearance). Stice and colleagues (e.g., Stice & Agras, 1998; Stice, Shaw, & Nemeroff, 1998) have provided extensive information about the scale's validity. Due to high correlations among the subscales, only pressures experienced to lose weight, exercise, be more attractive, and change appearance were used in the current study.

Procedures

The university's institutional review board approved this study, and all participants signed informed consent forms prior to completing the surveys. Time 1 data were collected as

part of a larger study funded by the NCAA, whose purpose was to examine the physical and psychological well-being of female collegiate athletes (see Anderson et al., 2011 for a detailed description of the methodology). The head coaches of Division I gymnastics and swimming/diving programs from universities across the United States were originally contacted to solicit the participation of their athletes; 26 participated. The coaches were first informed of the study by email; follow-up communications were carried out by phone and email. Coaches were informed of the NCAA grant and the purpose of the study, and requirements of participation were explained. At each participating university, coaches had to identify a contact person (e.g., athletic trainer) who would administer the surveys at their schools. Of the 26 programs who agreed to participate, athletic trainers, team managers, assistant coaches, and head coaches served in this role and were paid $150.00 for their assistance.

Prior to the first data collection, team contacts were emailed to schedule survey administration dates with the athletes. Subsequently, team contacts were mailed the exact number of surveys necessary for each given team, standardized instructions, and the researcher's contact information; follow-up phone calls were made to answer any questions. Time 1 data collection occurred during the last 2 weeks of February 2009 at which each athlete received an unsealed envelope containing the consent form and survey questionnaire. Team contacts first read the instructions, and then the athletes signed consent forms. Participation was voluntary, though no athlete refused to complete the questionnaires. Survey packets were completed anonymously (i.e., athletes did not put their names on the questionnaires), though each were coded by number so it could be matched to the questionnaires completed at Time 2; team contacts left the area so the athletes could respond in private.

We collected Time 2 data during 2015, which represented a six-year time span from the time at which Time 1 data were collected. Time 2 data was funded by a new, separate NCAA grant whose purpose was to support research examining the challenges female athletes face during retirement from college sports. To obtain current contact information for the retired athletes, the researchers contacted previous coaching staffs, athletic departments, sports information directors, alumni networks, and teammates of the athletes who participated at Time 1. Based on this information, the retired athletes were initially contacted via email to request participation; follow-up contact was made through email and telephone as needed. Data collection occurred through online survey participation, in which the participants first viewed an informed consent agreement and digitally consented to participate prior to completing the questionnaires. Participation was voluntary and the retired athletes provided no current identifying information (e.g., name). They did, however, enter a unique identifier into the website that allowed the researchers to match their Time 2 responses to their Time 1 data. The athletes were offered a $25.00 online gift certificate as compensation for their participation.

Data Analysis

Although 325 athletes participated at Time 1 and provided complete data, 132 did not participate at Time 2 as a result of being unable to be contacted, not responding to requests to participate, or providing incomplete data. Analyses in this study are based on the 193 athletes (response rate = 59.4%) who provided sufficient data at both collection times.

Research Question 1

Change in ED classification over time, based on QEDD responses, was examined through cross-tabulations and chisquare analyses. Further, all athletes' classifications from Time 1 were examined in relation to their Time 2 classifications to determine the extent to which movement

occurred between ED groups. Change in specific pathogenic weight control behaviors, based on the 7 items from the BULIT-R, also was examined through cross-tabulations and chisquare analyses. Again, all athletes' responses from Time 1 were examined in relation to their Time 2 responses to establish if pathogenic weight control behaviors changed over time and, if so, in what direction.

Research Question 2

A logistic regression analysis was used to examine the Time 1 psychosocial predictors of internalization, perceived pressures, negative affect, body dissatisfaction, and dietary restraint in relation to Time 2 QEDD classification (i.e., disordered or asymptomatic). The disordered classification consisted of the combination of clinical and subclinical ED groups. Statistical assumptions were examined, including multicollinearity of the predictor variables and the outcome variables' distributional properties (i.e., skewness, kurtosis, outliers). Sensitivity, specificity, and positive and negative predictive values of the model were examined as well.

CHAPTER 3

RESULTS

Change in Eating Disorder Prevalence over Time

The prevalence of ED classifications for each of the two time points, in addition to the lifetime prevalence (i.e., the total number classified in a specific category at either of the two time points), are reported in Table 1. At Time 2, the retired athletes were classified as having a clinical ED (*n* = 6; 3.1%), a subclinical ED (*n* = 52; 26.9%), and being asymptomatic (*n* = 135, 69.9%). Of the retired athletes meeting the criteria for a clinical ED diagnosis, four were classified with sub-threshold bulimia, one non-binge bulimia, and one bulimia nervosa. The lifetime prevalence, which included any athlete at either time point that was in a particular classification, included 168 who at one point met the criteria to be asymptomatic, 72 who were subclinical ED, and 18 who met the criteria for a clinical ED.

Crossovers between pairs of ED classifications (e.g., asymptomatic to subclinical) are presented in Figure 1. Of the 13 athletes who had a clinical ED at Time 1, by Time 2 seven (53.8%) had become asymptomatic and five (38.5%) subclinical; one (7.7%) continued to have a clinical ED (i.e., sub-threshold bulimia). Overall, 46.2% (*n* = 6) of the participants who met criteria for a clinical ED at Time 1 continued to meet the criteria for either a subclinical or clinical ED diagnosis at Time 2.

Of the 36 athletes who were subclinical at Time 1, 17 (47.2%) became asymptomatic, 16 (44.4%) remained subclinical, and three (8.3%) met the criteria for a clinical ED (i.e., non-binge bulimia = 1; sub-threshold bulimia = 2) at Time 2. Overall, 52.8% (*n* = 19) of the participants who were subclinical at Time 1 continued to meet the criteria for either a subclinical or clinical ED at Time 2.

Of the 144 athletes who were classified as asymptomatic at Time 1, 77.1% (n = 111) remained so at Time 2, whereas 21.5% (n = 31) became subclinical and 1.4% (n = 2) reported the symptoms of a clinical ED (i.e., bulimia = 1; sub-bulimia = 1). Overall, 22.9% (n = 33) of the participants who were asymptomatic at Time 1 reported symptoms that met the criteria for either a subclinical or clinical ED at Time 2.

In order to examine the change between classifications over time and meet the assumptions of a chi square analysis (i.e., cell counts of 5 or more each), the clinical and subclinical ED classifications were combined into a disordered eating group. The Time by Classification analysis was significant, χ^2 [1, N = 193] = 13.74, $p < .001$. Overall, for those athletes who were asymptomatic at Time 1 (n = 144), 111 remained asymptomatic where 33 developed the symptoms of an ED at Time 2. Of the athletes who were in the disordered eating group at Time 1, 51.0% (n = 25) continued to report such symptoms and 49.0% (n = 24) became asymptomatic at Time 2. Thus, there was a significant increase in the disordered eating category over time (from 25.4% to 30.1%) and a significant decrease in the percentage of athletes who were asymptomatic (from 74.6% to 69.9%) from Time 1 to Time 2.

Change in Pathogenic Weight Control Behavior Prevalence Over Time

Exercising for Weight Loss

At Time 1, 62 women indicated exercising 2 or more hours per day specifically to burn calories; at Time 2, only six of these women (9.7%) maintained this frequency. Of the 131 athletes who reported exercising less than 2 hours per day to burn calories at Time 1, 98.5% (n = 129) maintained this frequency at Time 2. Regarding lifetime prevalence, 64 endorsed exercising 2 or more hours a day and 187 for exercising less than 2 hours per day at either Time 1 or Time 2. See Table 2 and Figure 2.

Fasting or Strict Dieting

Of the 18 athletes at Time 1 who reported fasting or going on strict diets 4 or more times in the past year, only 27.8% (n = 5) maintained this frequency at Time 2. Of the 175 women who were fasting 3 or fewer times per year at Time 1, the majority maintained this frequency at Time 2 (n = 166, 94.9%). The lifetime prevalence for those who at one point reported fasting 4 or more times per year was 27, whereas the frequency for 3 times per year or less was 188. See Table 2 and Figure 3.

Vomiting

At Time 1, eight women reported vomiting one or more times per month to control their weight; two (25.0%) of these women remained doing so at Time 2. Of the 185 athletes who were vomiting less than once per month at Time 1, five (2.7%) increased their use of vomiting to one or more times per month. The lifetime prevalence for those who endorsed at one point vomiting one or more times per month was 13, whereas the frequency for less than once per month was 189. See Table 2 and Figure 4.

Laxative/Suppository Use

At Time 1, eight athletes (4.1%) endorsed using laxatives/suppositories two or more times per month; none of these women continued at this frequency at Time 2. Of the 185 women who used a laxative/suppository once per month or less at Time 1, five (2.7%) increased their use to two or more times per month at Time 2. The lifetime prevalence for those who reported laxative use two or more times per month was 13, whereas the frequency for once per month or less was 193. See Table 2 and Figure 5.

Diuretic Use

At Time 1, nine women (4.7%) reported using diuretics one or more times per month; only one (11.1%) sustained this frequency at Time 2. Of the 183 athletes who were using diuretics less than once per month at Time 1, four retired athletes (2.2%) increased their use to one or more times per month at Time 2. The lifetime prevalence rates were 13 for those who used diuretics one or more times per month and 191 who used diuretics less than once per month. See Table 2 and Figure 6.

Binge Eating

At Time 1, 12 athletes reported binge eating 2 or more times per week; only one of these women (8.3%) maintained this frequency at Time 2. Of the 181 athletes who were binge eating once a week or less at Time 1, 97.8% (n = 177) remained at this frequency at Time 2; four (2.2%) increased their binge eating behavior to 2 or more times per week. The lifetime prevalence of binge eating 2 or more times per week was 16, whereas the rate for binge eating once per week or less was 192. See Table 2 and Figure 7.

Predictors of Disordered Eating Behaviors

A logistic regression analysis was performed to examine the relationship of the Time 1 psychosocial predictors of internalization, perceived pressures, negative affect, body dissatisfaction, and dietary intent to Time 2 QEDD classification (i.e., asymptomatic or disordered eating [i.e., the subclinical and clinical ED categories combined]). Statistical assumptions, including multicollinearity of the predictor variables and distributional properties of the sample, were examined and found to be within normal limits.

The full model containing the predictors was significant, χ^2 [13, N = 193] = 31.03, p = .003, indicating that the model was able to distinguish between the asymptomatic and the

disordered eating retired athletes. The model as a whole explained between 14.9% (Cox and Snell R square) and 21.1% (Nagelkerke R square) of the variance in disordered eating categories, and correctly classified 73.6% of cases overall (90.4% of the asymptomatic athletes were correctly classified and 34.5% of those in the disordered eating group). Although the classification of the disordered eating athletes is low to moderate, it is far higher than the prior probabilities for the group based on actual cell sizes (0.0).

Only two of the psychosocial variables, dietary intent and feeling sad, made a unique and statistically significant contribution to the model. For every one unit increase in dietary intent, the women were 2.22 times more likely to be classified as disordered in their eating. For every one unit increase in their level of sadness at Time 1, the women were 1.62 times more likely to report the symptoms of a subclinical or clinical ED at Time 2. See Table 3.

CHAPTER 4

DISCUSSION

The overall number of athletes classified with a clinical ED decreased over the six years from 13 (6.7%) at Time 1 to six (3.1%) at Time 2. Only one athlete with an ED at Time 1 maintained a clinical ED at Time 2; the remainder became subclinical (n = 5) or asymptomatic (n = 7). At Time 1, one athlete met criteria for bulimia, and the remaining 12 for EDNOS (e.g., sub-threshold bulimia, binge eating disorder). Similarly at Time 2, five athletes were diagnosed with EDNOS and one with bulimia nervosa. That most of the athletes, active or retired, met criteria for EDNOS rather than AN or BN is consistent with past ED prevalence research in female athletes (e.g., Carter & Rudd, 2005; Greenleaf et al., 2009; Sundgot-Borgen & Torsveit, 2004). Women who meet criteria for EDNOS typically report a lower intensity or frequency of the behaviors required to meet criteria for AN or BN. Athletes, especially when in the midst of training and competing as these women were at Time 1, have considerable demands placed upon them, often taxing them physically and psychologically. Athletes with full clinical symptoms of AN or BN would likely have difficulty managing these demands and maintaining a necessary level of sport performance. As such, they likely would be identified and referred to treatment by sports medicine personnel. Given that the behavioral disturbances associated with EDNOS are less severe and less disruptive to training, and easier for athletes to hide or conceal than clinical EDs, it is not surprising that this diagnosis was the most prevalent clinical ED in our sample.

The trend for clinical EDs to decrease from the college years into early adulthood, as we found in our study, is consistent with non-athlete research (Holland et al., 2013; Stice, Marti, & Rohde, 2013). For example, Holland et al. (2013) sampled male and female undergraduates once during their college tenure and again ten years later. They found that 14.3% of women met

criteria for an ED at Time 1, but only 5.0% did so at Time 2. Such declines can be attributed, in part, to disordered eating onset peaking during late adolescence (Lewinsohn, Striegel-Moore, & Seeley, 2000; Stice et al., 2013), and the college environment being a risk factor for the development of disordered eating behaviors in women (e.g., Delinsky & Wilson, 2008). In our sample, the retired athletes' ages ranged from 24 to 29 years and they were several years removed from both the collegiate and the sport environments. However, in longitudinal research of female athletes, studies have shown that prevalence rates have remained stable or even increased (e.g., Krentz & Warschburger, 2013; Thompson et al., 2017). Such increases may have been due to the researchers assessing shorter time frames (i.e., six to 12 months) or the fact the athletes were still competing in their sports. Female athletes' eating disturbances may be most severe when they are younger and currently or recently embedded in the sport environment, where pressures surrounding weight and body shape are present and more influential (Reel, Petrie, Soohoo, & Anderson, 2013).

Significant changes in prevalence occurred over time across the subclinical ED category, increasing from 18.7% to 26.9%; about half of the athletes who were subclinical (49%) at Time 1 remained so at Time 2. Consistent with past research (e.g., Stice et al., 2013), only a small number of the athletes who were subclinical at Time 1 (n = 3; 8.3%) developed a clinical ED six years later. For the remainder of the Time 1 subclinical athletes, their symptoms remitted sufficiently to be classified as asymptomatic at Time 2. The fact that over 30% of the retired athletes demonstrated some level of disordered eating is concerning because emotional distress (e.g., sadness, anxiety, stress; Petrie et al., 2009a), physical health problems (e.g., electrolyte imbalance, bone mineral density deterioration, dehydration; Beals, 2000; Treasure et al., 2010), and body image concerns (e.g., body dissatisfaction, beliefs about being overweight; Greenleaf et

al., 2009) have been associated with both clinical and subclinical EDs. These results suggest an overall increase in subclinical disordered eating behaviors over time, despite the fact that the athletes had been retired between two and six years and away from competition and the sport environment. Thus, ED symptoms, though not likely to be severe enough to warrant a clinical diagnosis, continue to exist in a substantial number of female athletes even after having departed from the collegiate sport environment.

Of the athletes classified as asymptomatic at Time 1 (n = 144, 74.6%), the majority (77.1%) remained so in retirement; the remainder developed disordered eating symptoms by Time 2 (subclinical ED - 21.5%; clinical ED - 1.4%). Our findings are consistent with past research (e.g., Krentz & Warschburger, 2013; Thompson et al., 2017) in two ways. First, most female athletes engage in healthy eating behaviors and these remain consistent over time, such as through a competitive season or into retirement. Second, despite this positive reality, a considerable percentage of asymptomatic athletes will develop symptoms over time. For example, Martinsen et al. (2014) found that 13.1% of elite adolescent female athletes who were classified as "healthy" eaters at baseline suffered from an ED two years later. The increased number of athletes in our sample who became subclinical may reflect the body image distress and eating concerns that can result from the onset of retirement (e.g., Kerr & Dacyshyn, 2000; Stirling et al., 2012; Warriner & Lavallee, 2008). Elite gymnasts have cited increased body dissatisfaction, guilt about changes in body composition, and internalization of weight pressures in the sport environment as reasons for their eating behaviors worsening upon retirement (Stirling et al., 2012). In retirement, athletes are likely to experience and struggle with loss of muscle tone, increased weight (and body fat), lack of standardized exercise regimens, and

decreased caloric need; such changes may result in increased body dissatisfaction and the use of unhealthy weight management strategies (e.g., dieting).

Athletes commonly use exercise and dieting/fasting to control their weight (e.g., Greenleaf et al., 2009; Thompson et al., 2017), which was confirmed among our retired athletes. Fewer of the retired athletes, however, engaged in these weight control behaviors compared to when they were active competitors; use of exercise decreased from 32.1% to 4.2% of the sample and dieting/fasting from 9.3% to 7.3%. Even fewer athletes reported using other weight control methods, such as vomiting and laxatives, across both time points. The fact that fewer athletes used weight control behaviors over time is promising and consistent with Thompson et al. (2017) who documented similar decreases in athletes' use over a five-month competitive season. Despite this positive trend toward decreased use, a small subset of athletes continued or worsened their weight control behaviors in retirement. Retired elite gymnasts (Stirling et al.; 2012) have attributed their likelihood of engaging in compensatory behaviors in retirement to previous pressures in sport to lose weight, prior ED behaviors, lack of support during retirement, and continued involvement in the sport environment (e.g., coaching).

The full regression model was significant, explaining 14.9% to 21.1% of the variance in disordered eating categories; it correctly classified 73.6% of the athletes in our sample. Of the psychosocial variables we considered from the Petrie and Greenleaf (2012) model, the extent to which the athletes felt sad and reported the intention to restrict their caloric intake significantly predicted their being classified in the disordered eating group. Stice (2016), in his review of risk factors for ED onset, found that body dissatisfaction, negative affect, thin-ideal internalization, perceived pressures for thinness, dieting, and deficient family support most consistently predicted disordered eating for timeframes ranging from one to five years. Of these variables,

dieting was the most important one for our sample of collegiate athletes and its effects extended to six years.

The unique contributions of dietary intent and sadness are consistent with cross-sectional research with female athlete samples (e.g., Anderson et al., 2011; Greenleaf et al., 2010). Anderson et al. (2011) sampled 414 female collegiate gymnasts, swimmers, and divers on the relations between psychosocial variables and bulimic symptomatology, and found that 55% to 58% of its variance was explained by the direct effects of negative affect, body satisfaction, and dietary restraint. Similarly, Greenleaf et al. (2010) found that higher levels of guilt, body dissatisfaction, and dietary restraint were related to increased bulimic symptoms. The effects of dietary intent were particularly strong with our sample, and may be based on the fact that such intentions have been found to be relatively stable over time, in both female undergraduates (Spoor et al., 2006) and female collegiate athletes (Anderson et al., 2012). In other words, athletes' attitudes and behaviors toward food and eating that exist while active competitors may stay with them into retirement and, as our results suggest, strongly determine their ED classification. Furthermore, dietary intentions have been found to be a precursor to binge eating (e.g., Andres & Saldana, 2014; Stice, Davis, Miller, & Marti, 2008) and bulimic-related (Stice et al., 2008) behaviors. Thus, athletes with strong dietary intentions while active competitors are at risk for maintaining these intentions and developing disordered eating over time.

Although our longitudinal methodology and collection of quantitative data in retirement represented a substantive improvement over past athlete-eating disorder research (e.g., Carter & Rudd, 2005; Greenleaf et al., 2009; Thompson et al., 2017), limitations existed. First, we used only self-report assessments, which could have been influenced by a social desirability bias, resulting in an underreporting of symptoms. Although structured clinical interviews are the gold

standard for determining diagnoses (Sundgot-Borgen & Torstveit, 2004), the geographical realities of our sample made this option unrealistic. Second, despite our sample's geographic and university-program diversity, the participants were drawn from two "weight-sensitive" sports (Martinsen & Sundgot-Borgen, 2013), which limits generalizability. Third, we collected data only at one time point six years following our initial data collection. Thus, we could not evaluate how changes in classification may have occurred over shorter periods of time. Future studies might assess athletes more consistently (and often) as they move through their competitive tenure and into retirement to determine how their ED risk might fluctuate. Fourth, although the athletes were retired from their collegiate sports at the Time 2 data collection, we did not gather information about the extent to which they remained involved in their respective sport environments during retirement. Continued sport involvement has been cited as a facilitator of engaging in unhealthy weight control behaviors during retirement (Stirling et al., 2012). Thus, researchers might examine the extent to which athletes remain involved in their sports in retirement, and in what form, and how such involvement may be related to their ED risk. Finally, we did not request information about the athletes' treatment-seeking behaviors over the course of the past six years. Some may have sought treatment to aide with disordered eating concerns they were experiencing and, as a result of the treatment, were healthy by Time 2. A more consistent and frequent assessment of symptoms over time would allow for examination of how treatment might be related to improvements in athletes' eating behaviors and psychological health.

Although there were fewer athletes who reported symptoms of a clinical ED at Time 2, there were significantly more who were classified as subclinical, developing primarily from the athletes who initially were asymptomatic. These findings suggest that departure from the sport

environment does not result in immediate remittance of eating concerns. In fact, for a substantial minority, the stress of retirement may serve to increase their risk as evidenced by the increased number who experienced symptoms at the subclinical level. Given that dietary intention was the strongest predictor of later ED classification, support personnel (e.g., athletic trainers, nutritionists) should educate athletes about proper nutrition and how to eat healthfully when they are active competitors. Such education could occur in the context of team workshops or individual meetings to develop tailored meal plans. Female athletes who are struggling with body image concerns and who are being highly restrictive with their caloric intake might be referred to a mental health professional trained in ED treatment. Previous research (e.g., Martinsen et al., 2014) indicates the efficacy of intervention programs helping athletes deemed 'healthy' (i.e., did not meet risk or ED classification) at baseline maintain this disposition, and help those with ED symptoms become healthy, up to a year following the intervention. Early intervention efforts, while the athletes are actively competing in their sports, may help to alleviate eating and body image concerns when they retire several years later.

Over a six-year period that spanned from active competition into retirement, fewer of the female collegiate swimmers and gymnasts in our sample reported symptoms of clinical EDs or used specific pathogenic weight control behaviors. There was, however, a significant increase in the number of athletes who reported subclinical symptoms across the six years, and the classification of such symptoms was explained primarily by the athletes' intentions to diet while they were active competitors. Thus, addressing psychosocial predictors, in particular dietary intent, while athletes are active competitors should be a focus for sports medicine personnel if they want to foster health into retirement.

Table 1

Prevalence of Eating Disorder Classification in a Sample of 193 Retired Collegiate Female Athletes

Eating Disorder Classification	Lifetime Prevalence *n*	Time 1 *n* (%)	Time 2 *n* (%)
Asymptomatic	168	144 (74.6)	135 (69.9)
Subclinical ED	72	36 (18.7)	52 (26.9)
Clinical ED	18	13 (6.7)	6 (3.1)
Anorexia	0	0 (0.0)	0 (0.0)
Bulimia	2	1 (0.5)	1 (0.5)
ED-NOS	17	12 (6.2)	5 (2.6)
Sub-bulimia	6	2 (1.0)	4 (2.1)
Non-binge bulimia	6	5 (2.6)	1 (0.5)
Binge eating	5	5 (2.6)	0 (0.0)

Note. Lifetime prevalence = the total number of participants classified in a specific category at either of the two time points, such that the overall *N* may exceed 193; ED = Eating Disorder; ED-NOS = Eating Disorder Not Otherwise Specified.

Table 2

Prevalence of Pathogenic Eating and Weight Control Behaviors in a Sample of 193 Retired Collegiate Female Athletes

Pathogenic Weight Control Behavior	Lifetime Prevalence *n*	Time 1 *n* (%)	Time 2 *n* (%)
Exercise to Burn Calories			
2 hours or more/day	64	62 (32.1)	8 (4.1)
Less than 2 hours/day	187	131 (67.9)	185 (95.9)
Fasting			
4x or more/year	27	18 (9.3)	14 (7.3)
3x or less/year	188	175 (90.7)	179 (92.7)
Intentionally Vomit			
1x or more/month	13	8 (4.1)	7 (3.6)
Less than 1x/month	189	185 (95.6)	186 (96.4)
Laxative/Suppository Use			
2x or more/month	13	8 (4.1)	5 (2.6)
1x or less/month	193	185 (95.9)	188 (97.4)
Diuretic Use			
1x or more/month	13	9 (4.6)	5 (2.6)
Less than 1x/month	191	183 (94.8)	187 (96.9)
Frequency of Binge Eating			
2x or more/week	16	12 (6.2)	5 (2.6)
1x or less/week	192	181 (93.8)	188 (97.4)

Note. One participant was missing data for the specific pathogenic weight control behavior diuretic use.

Table 3

Predictors of Symptomatic Classification of Disordered Eating

	B	Wald	OR	95% C.I.	
SATAQ-3					
General	-.428	2.741	.652	.393	1.082
Athlete	-.037	.021	.963	.579	1.603
PSPS					
Lose Weight	-.568	1.573	.567	.233	1.377
Exercise	.425	1.875	1.529	.833	2.808
More Attractive	.103	.071	1.109	.519	2.367
Change Appearance	-.233	.398	.792	.384	1.634
PANAS-X					
Guilt	.051	.021	1.052	.526	2.103
Anger	-.320	.674	.726	.338	1.560
Fear	-.096	.112	.908	.517	1.595
Sad	.483	3.894*	1.620	1.003	2.617
BPSS-R					
Face	.052	.037	1.053	.621	1.785
Body	-.507	3.046	.602	.341	1.604
DIS	.797	7.998*	2.219	1.277	3.856
Constant	.437	.063	1.548		

Note. OR = Odds Ratio; SATAQ-3 = Sociocultural Attitudes Towards Appearance Questionnaire-3; PSPS = Perceived Sociocultural Pressures Scale; PANAS-X = Positive and Negative Affective States-Extended Version; BPSS-R = Body Parts Satisfaction Scale-Revised; DIS = Dietary Intent Scale.* $p < .05$

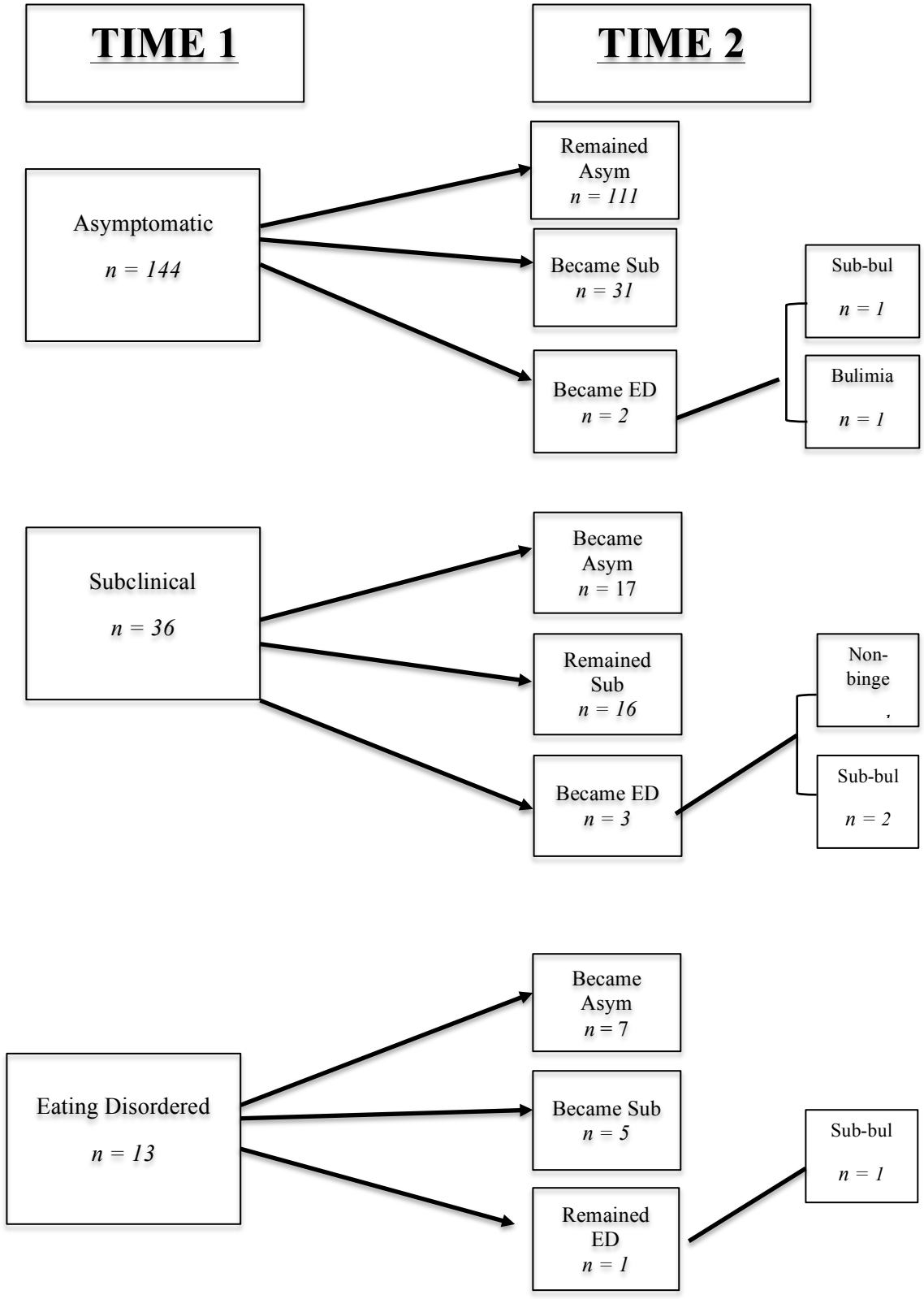

Figure 1. Eating disorder classification from Time 1 to Time 2.

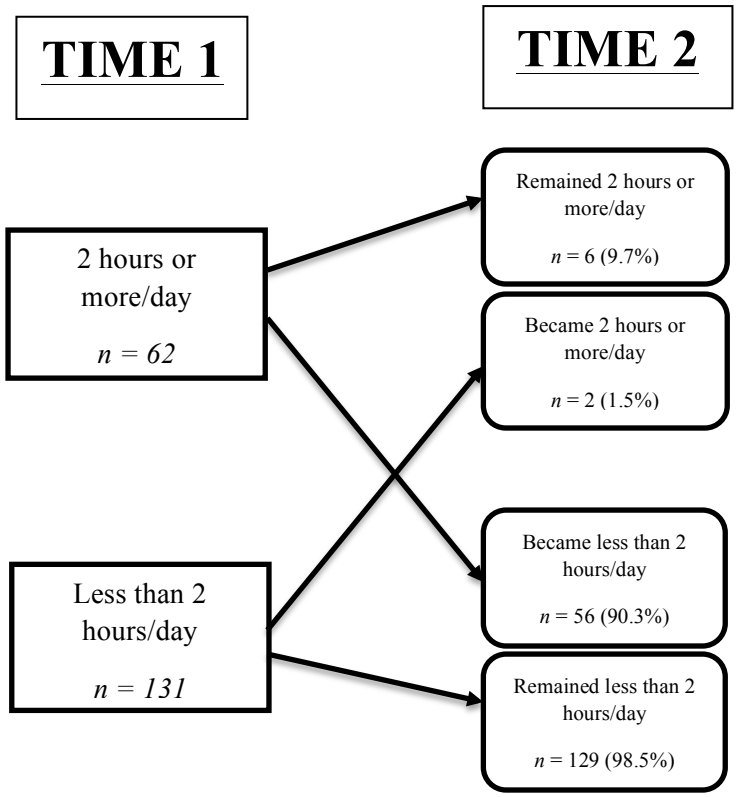

Figure 2. Change in exercise to burn calories from Time 1 to Time 2.

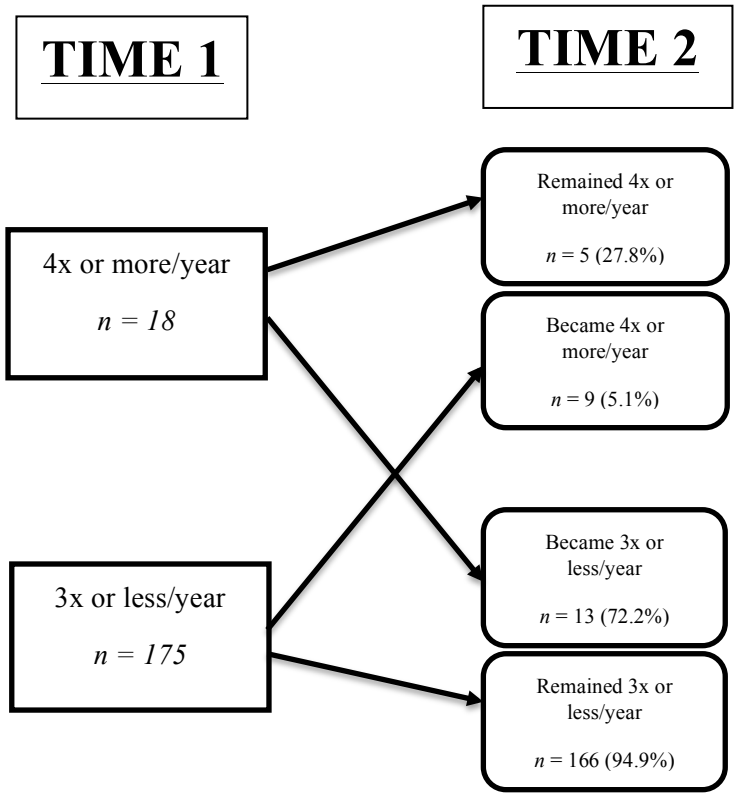

Figure 3. Change in fasting from Time 1 to Time 2.

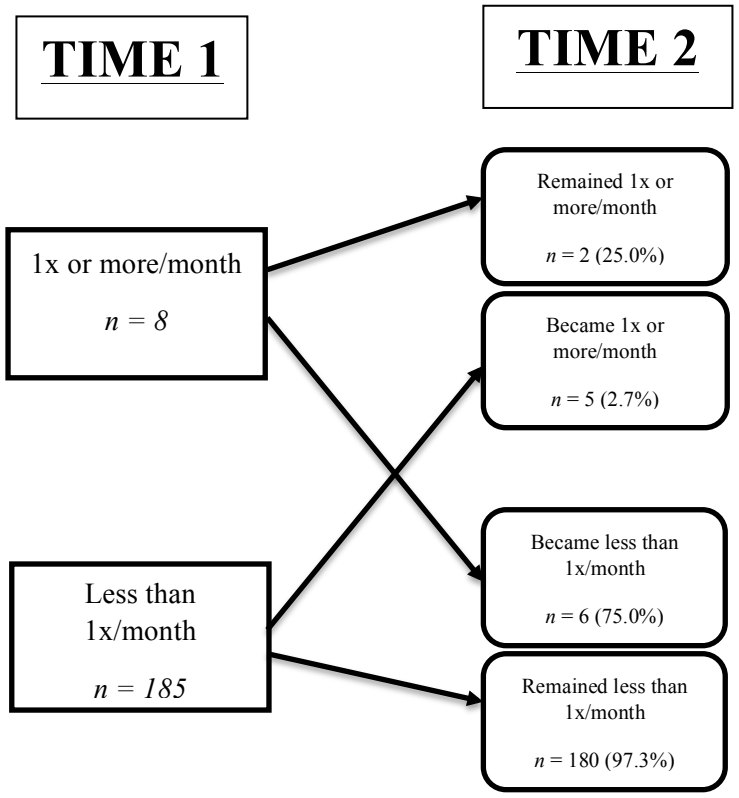

Figure 4. Change in intentional vomiting from Time 1 to Time 2.

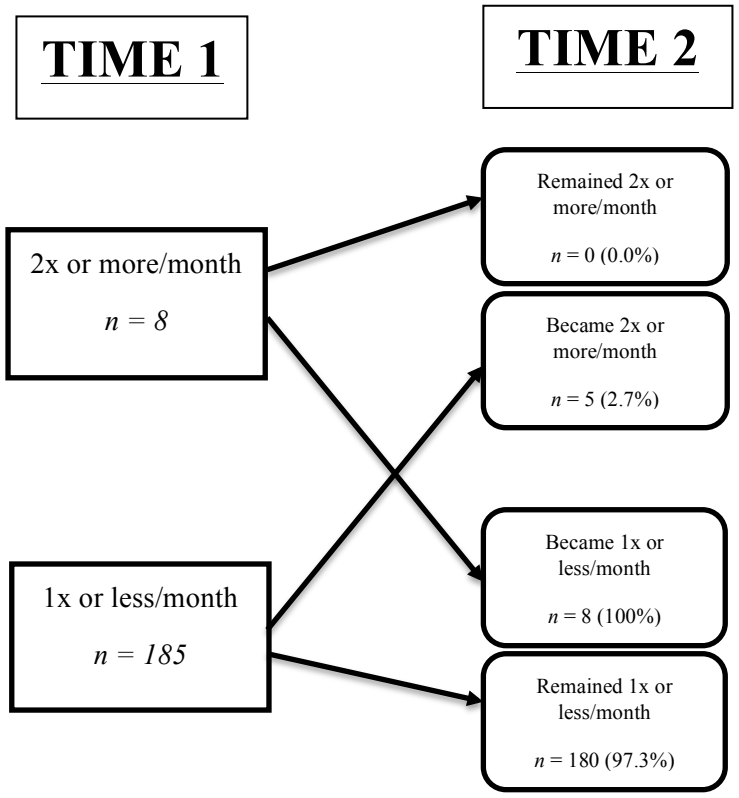

Figure 5. Change in laxative/suppository use from Time 1 to Time 2.

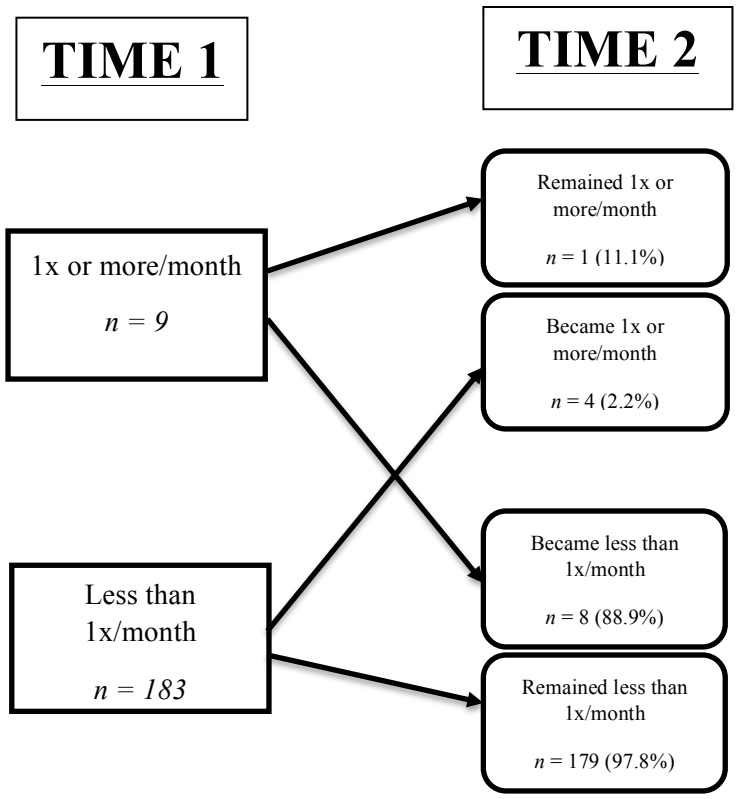

Figure 6. Change in diuretic use from Time 1 to Time 2.

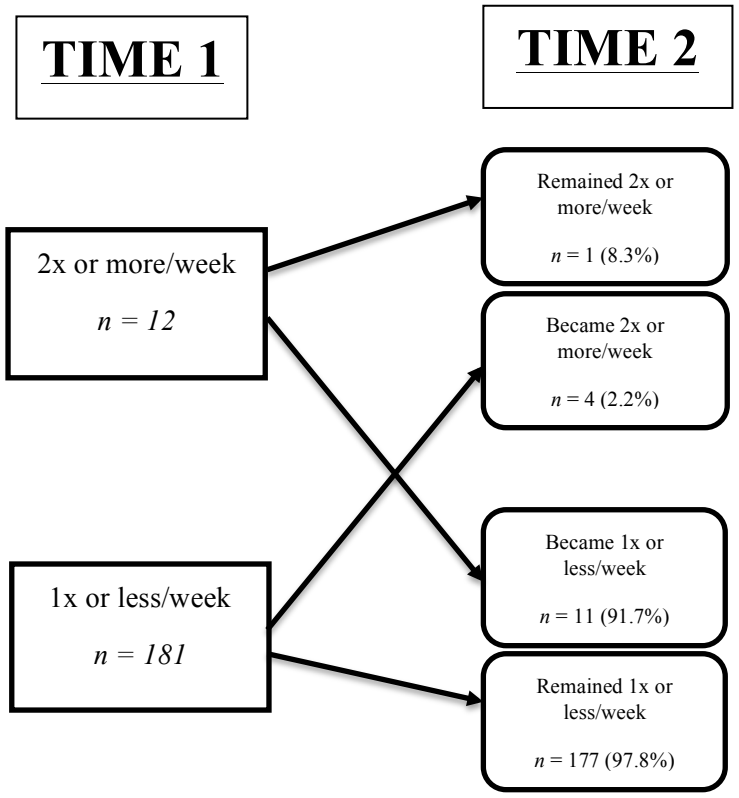

Figure 7. Change binge eating from Time 1 to Time 2.

APPENDIX

DISSERTATION PROPOSAL

Disordered Eating and the Female Athlete: From College Sport to Retirement

Elite and collegiate female athletes are a sub-population that have been identified as a high-risk group for the development of eating disorders (da Costa, Schtscherbyna, Soares, & Ribeiro, 2013; Gomes, Martins, & Silva, 2011; Kato, Jeva, & Culpepper, 2011; Krentz & Warschburger, 2011; Smolak, Murnen, & Ruble, 2000; Torres-McGehee, Monsma, Dompier, & Washburn, 2012), particularly because of the unique pressures in the sport environment about weight, eating, body size/shape, and appearance that emanate from coaches, teammates, and other sport personnel. These pressures can include weight limits, judging criteria that reinforce certain body shapes, publically conducted weigh-ins, stereotypical performance ideals (e.g., thin physique for long-distance runners), revealing uniforms, pressures from coaches and teammates to attain a certain physique, modeling of disordered eating behaviors by other athletes, a competition environment inundated with competitive personalities, and self-weighing (Arthur-Cameselle & Quartromoni, 2010; Carrigan, Petrie, & Anderson, 2015; Thompson & Sherman, 2010). Athletes also have to cope with the pressures of performing in front of audiences, experiencing physical training loads that vary throughout the year (i.e., in-season vs. off-season), and balancing the time demands and workloads of being a student and an athlete. The culmination of these stressors may be decreases in psychological well-being and a contribution to the development of disordered eating behaviors.

The unique nature of the collegiate sport environment, and the pressures associated with it, has prompted researchers to examine the prevalence of disordered eating behaviors in female athletes. Although prevalence studies have been conducted with samples of female collegiate athletes (e.g., Anderson & Petrie, 2012; Beals & Manore, 2002; Greenleaf, Petrie, Carter, & Reel, 2009; Kato et al., 2011), this line of study has been limited by the use of cross-sectional

designs. These methodologies provide useful information about disordered eating behaviors but at only a single point in time, what has been referred to as "point" prevalence (e.g., Beals & Manore, 2002; Petrie, 1993; Petrie, Greenleaf, Reel, & Carter, 2009a). Thus, these methodologies cannot address the stability of eating disorder classifications and disordered eating behaviors over different periods of time.

Previous research (e.g., Papathomas & Lavallee, 2014; Stirling, Cruz, & Kerr, 2012; Warriner & Lavallee, 2008) has demonstrated that athletes may continue to experience pressures related to weight, eating, body size/shape, and appearance even after ending active involvement in sport. Despite the recognition that food- and body-related pressures persist in the absence of the sport environment, researchers have yet to examine quantitatively the prevalence of disordered eating behaviors among retired female athletes as they transition from active collegiate sport competition. Employing longitudinal designs will allow researchers to examine the progression of pathological eating, and may provide an understanding of how eating disorders develop, abate, and/or intensify over time.

Eating Disorders Defined

Eating disorders are pathological disturbances in eating behavior that typically include acute misperceptions and concern about body shape and weight. They often involve extreme weight control behaviors, such as strict fasting, self-induced vomiting, excessive exercise, or laxative misuse (*Diagnostic and Statistical Manual of Mental Disorders-5 [DSM-5]*; American Psychiatric Association [APA], 2013). Currently, there are four categories of clinical eating disorders: (a) Anorexia Nervosa (AN), (b) Bulimia Nervosa (BN), (c) Binge-Eating Disorder (BED), and (d) Other Specified/Unspecified Feeding and Eating Disorders (APA, 2013). Other Specified/Unspecified Feeding and Eating Disorders (OSFED) replaced Eating Disorder Not

Otherwise Specified (EDNOS) as a diagnostic category for those individuals who demonstrate clinically significant disturbances in eating behavior, but do not meet full criteria for AN, BN, or BED. Eating disorders as a general psychological disorder warrant particular concern due to their association with a variety of co-morbidities, both psychological (e.g., anxiety, developmental disorders, mood disorders) and physiological (e.g., electrolyte imbalance, intestinal difficulties) in nature (Treasure, Claudino, & Zucker, 2010). Furthermore, eating disorders have a high risk of mortality; standard rates (i.e., ratio of observed deaths in the study population relative to expected deaths in the population of origin) due to eating disorders have ranged from 1.92 to 9.6 (Smink, van Hoeken, & Hoek, 2012).

Anorexia nervosa. AN is characterized by extreme restriction of calories and nutrients that leads to significantly low body weight, and is often associated with fear of gaining weight and misperception about one's body weight and shape (APA, 2013). The criterion of amenorrhea was dropped with the newest version of the DSM. AN has been associated with developmental disorders (i.e., autism spectrum, attention-deficit hyperactivity disorder; Treasure et al., 2010), anxiety disorders, both obsessive compulsive disorder and personality traits, major depressive disorder, and substance misuse (Hudson, Hiripi, Pope Jr., & Kessler, 2007). In addition to psychological distress, a variety of physiological effects can result from extreme dieting, some of which occur secondarily to nutritional deficits (Winston, 2004). Common physical complications associated with women with AN may include gastrointestinal disturbances (e.g., delayed gastric emptying), dental erosion, cardiovascular irregularities (e.g., low blood pressure, arrhythmias), electrolyte imbalances, bone mineral density loss, amenorrhea, dry skin, and sensitivity to cold (Winston, 2004).

Bulimia nervosa. The defining feature of BN is recurrent episodes of binging and purging behaviors occurring at least once per week for 3 months (APA, 2013). Binging is defined as eating an amount of food that is significantly larger than one would typically eat in a given time period, and normally is accompanied by an inability to control or stop oneself. Within BN, binges are followed by an episode of purging or compensatory behaviors, such as vomiting, laxative or diuretic misuse, fasting, or excessive exercise. In addition to these behaviors, individuals' self-evaluation is negatively influenced by their body shape and weight. Associated psychological co-morbidities may include affective disorders (e.g., depression, bipolar disorder), anxiety disorders (e.g., specific phobia, social phobia, post-traumatic stress), impulse control disorders (e.g., attention-deficit hyperactivity, oppositional defiance), and substance misuse (Hudson et al., 2007; Treasure et al., 2010). Physiological disturbances typically result from purging behaviors (i.e., vomiting, laxative misuse, fasting, excessive exercise) rather than binging, and can include dehydration, electrolyte imbalances, acute renal failure, nutritional deficiencies, dental erosion, menstrual dysfunction, and inflammation of esophageal lining (Winston, 2004).

Binge eating disorder. BED was previously categorized as EDNOS, but now represents its own category in the DSM-5 (APA, 2013). Like BN, BED consists of episodes of binge eating, but without the use of pathogenic weight control behaviors. Further, BED episodes are characterized by three of the following: eating more rapidly than normal; eating until uncomfortably full; eating large amounts of food when not feeling physically hungry; eating alone because of embarrassment of the quantity one is eating; and feeling disgusted, depressed, or guilty afterward. Psychological co-morbidities that have been related to BED may include anxiety disorders (e.g., specific phobia, social phobia), mood disorders (e.g., depression),

impulse control disorders (e.g., attention-deficit hyperactivity, oppositional defiance), personality disorders (e.g., avoidant, borderline), and substance misuse (Hudson et al., 2007). Physical complications can include obesity, fibromyalgia, irritable bowel syndrome, insomnia, and physical inactivity (Javaras et al., 2008).

Other specified/unspecified feeding or eating disorders. Other specified/unspecified feeding and eating disorders (OSFED) replaced EDNOS as a diagnostic category and applies to those individuals who demonstrate clinically significant disturbances in eating behavior, but do not meet full criteria for any of the above three disorders (APA, 2013). Examples of specified eating disorders include atypical anorexia or bulimia nervosa, in which symptoms of AN or BN are present, but the weight requirement for AN or the frequency of binge/purge behaviors for BN is not met. Unspecified eating disorders typically represent a category of disorders in which there is clear psychological distress resulting from eating disturbances, but for which limited information is available to make a more discerning diagnosis. Psychological and physiological co-morbidities vary within this category and depend on the predominant symptomatology exhibited (i.e., symptoms of anorexia, bulimia, or BED).

Subclinical disordered eating. Subclinical (or symptomatic) eating disorders are not considered a diagnostic category within the DSM-5 (APA, 2013), though this level of symptomatology has been recognized and classified and researchers have demonstrated that symptomatic individuals often report levels of body image concerns and disordered eating attitudes and behaviors similar to those who have a clinical disorder (e.g., Cohen & Petrie, 2005; Peck & Lightsey Jr., 2008). These disorders are defined by the presence of eating disorder symptoms that do not meet full criteria or severity for one of the clinical disorders, including OSFED (e.g., Beals, 2000; Greenleaf, et. al, 2009; Williams, Sargent, & Durstine, 2003).

Subclinical disorders may include pathological disturbances in eating behavior and misperceptions about body weight and shape, but can be distinguished from OSFED because they are less severe, in terms of frequency or intensity of symptoms, than clinical eating disorders. For example, bulimia nervosa of low frequency and/or duration is a type of OSFED, in which all criteria for bulimia nervosa are met, except that binge eating and compensatory behaviors occur less than once per week or have occurred for less than 3 months. In comparison, behavioral bulimia is a subclinical type of bulimia nervosa, in which all criteria for bulimia are met, including frequency and duration, but the individual reports feeling in control during a binge or self-esteem is not influenced by weight or body shape. Similar to clinical eating disorders (e.g., AN, BN), subclinical disorders often involve negative self-evaluation based on body image and can include the use of pathogenic weight control behaviors, such as diet restriction (Beals & Manore, 1998), bulimic behaviors, concern for dieting, and weight fluctuation (Cohen & Petrie, 2005).

Disordered Eating Prevalence in Women

Anorexia nervosa. Research has only recently begun to be conducted using DSM-5 categories (e.g., Stice, Marti, & Rhode, 2013; Smink, van Hoeken, Oldehinkel, & Hoek, 2014). For example, Stice et al. (2013) applied expected DSM-5 criteria to data they had collected from a sample of 496 U.S. female adolescents over an 8-year period. The girls/women were assessed annually (i.e., allowing for 8 total assessments) and the participants' ages ranged from approximately 12 years at the beginning of the study to 23 years at its conclusion. The lifetime prevalence rate (i.e., the number of participants who met criteria at baseline or exhibited onset of a disorder during follow-up) was 0.8%. In another study that was part of a larger prospective investigation, Smink et al. (2014) examined Dutch female adolescents over a 10-year period.

The participants were assessed four times; their ages ranged from approximately 11 years at the initial assessment to 19 years by the end of the investigation. The lifetime prevalence rate for the 1,597 Dutch girls was 1.7%. The differences in prevalence rates across the Smink et al. (2014) and Stice et al. (2013) studies may in part be due to measurement differences between the two. Because the DSM-5 was not released prior to data collection, Stice et al. (2013) made predictions of the alterations expected in the new DSM, thereby creating their own operational decisions. Their operational definition of AN included: BMI less than 85% of the median expected for age and gender, fear of weight gain for more than 75% of days for at least three months, and weight and shape were main aspects of self-evaluation. Thus, Stice et al.'s criterion included a specific weight requirement instead of addressing restriction of energy intake, which may have led to under-representation of AN in their study.

In a review of the epidemiology of eating disorders (Smink, et al., 2012), lifetime prevalence rates of AN were reported using both DSM-4-TR and DSM-5 criteria. The authors reviewed several population-based studies of adult women from Sweden, Australia, and Finland, and reported rates of 1.2%, 1.9%, and 2.2% using DSM-4-TR criteria, and 2.4%, 4.3%, and 4.2% with DSM-5 criteria, respectively. These findings indicate a higher prevalence of AN using DSM-5 criteria than the aforementioned studies, which may have resulted due to the removal of a specific weight requirement and amenorrhea as a diagnostic criteria. DSM-4-TR average lifetime prevalence rates range from approximately 0.5% to 2.2% (APA, 1994; Le Grange, Swanson, Crow, & Merikangas, 2012; Smink et al., 2012; Treasure et al., 2010), which is on the lower end of the range of prevalence rates for AN using DSM-5 criteria (i.e., 0.8% to 4.3%; Smink et al, 2012; Smink et al., 2014; Stice et al., 2013).

Prevalence rates using DSM-5 criteria are expected to be higher than those based on the DSM-4-TR because of the changes in criteria between the two versions. A major focus of the DSM-5 was to be more inclusive and descriptive of individuals experiencing impairment as a result of disturbed eating behaviors so as to lessen the number who would fall into the EDNOS category and increase specificity of diagnosis (Murray & Anderson, 2015; Thompson & Sherman, 2014). DSM-5 criteria removes a specific weight requirement (i.e., of less than 85% weight expected given age and gender) and instead suggests that restriction of energy intake led to low body weight in the context of developmental trajectory. Additionally, DSM-5 removed the criterion of amenorrhea, a physiological side effect of AN that many, but not all, experience. These changes allow for greater inclusion of those who have obtained low body weight but have not reached 85% of their expected weight and who have retained their menstrual cycle, the culmination of which likely contribute to a higher prevalence rate than established with DSM-4-TR criteria.

Bulimia nervosa. Initial research using DSM-5 criteria has reported lifetime prevalence rates ranging from 0.8% (Smink et al., 2014) to 2.6% (Stice et al., 2013), which are comparable to DSM-5 prevalence rates of AN. In their epidemiological review, Smink et al. (2012) reported lifetime prevalence rates for BN per both DSM-4-TR and DSM-5 criteria, respectively, that were 1.7% and 2.3% (Finnish female twins), and 1.2% and 1.6% (Swedish female twins). Using only DSM-4-TR criteria, they reported rates of BN ranging from 0.9% to 1.5% for U.S. and European women, 2.9% for Australian female twins between the ages of 28 to 39 years, and 1.3% to 1.6% for U.S. female adolescents. Initial prevalence research of BN using DSM-5 criteria seems to demonstrate moderate consistency and may be on the higher end of prevalence ranges using DSM-4-TR criteria (Smink et al., 2012; Smink et al., 2014; Stice et al., 2013).

Binge eating disorder. Although BED was only added as its own clinical diagnosis in the most recent version of the DSM, in the DSM-4 it was listed as a diagnosis for further study so researchers have examined it as a sub-category of EDNOS over the years (e.g., Hudson et al., 2007; Le Grange et al., 2012; Smink et al., 2012; Treasure et al., 2010). Stice et al. (2013) reported lifetime prevalence rates of 3.0% in 496 female adolescents, which was comparable to the 2.3% of the 861 female adolescents in the Smink et al. (2014) study who also were classified with BED. BED was the most prevalent eating disorder in Hudson et al.'s (2007) study with a reported lifetime rate of 3.5% in women.

Smink et al.'s (2012) comprehensive review of epidemiological research publications of eating disorders, limited to articles published in English, provides a description of the incidence, prevalence, and mortality rates of eating disorders. From their review, they cited lifetime prevalence rates of BED were 1.9% for women drawn from a large population based study of six European countries. In another reviewed study, they noted higher rates for U.S. women (3.5%), which may have been due to the use of less stringent criteria (i.e., duration of three months instead of standard six months for DSM-4 research criteria). The U.S.-based study also included estimates of BED using DSM-5 criteria, which then ranged from 0.1% to 3.6%. In a large sample of adult Swedish female twins, the average lifetime prevalence of BED was 0.17%, which increased to 0.35% using DSM-5 criteria. The differences in prevalence rates across countries may be due to cultural differences related to food or meal portions between European countries and the United States.

Other specified/unspecified eating disorders. One of the goals of the American Psychiatric Association (APA) eating disorders work group was to better represent individuals within the historically EDNOS category by making the primary eating disorder categories (i.e.,

AN, BN, BED) more inclusive and, thus, representative (Walsh, 2009). Therefore, it would be expected that prevalence rates in the Other Specified/Unspecified category, meant to replace EDNOS, would be lower than they have been previously reported within the DSM-4 classification system.

In Stice et al.'s (2013) longitudinal investigation of female adolescents, the lifetime prevalence rate of the Other Specified/Unspecified category was 25.7% (i.e., 11.5% = unspecified, 2.8% = atypical AN, 4.4% = subthreshold BN, 3.6% = subthreshold BED, 3.4% = purging disorder). Smink et al. (2014) found a much smaller lifetime prevalence rate of 0.8% for OSFED, 0.6% of which were specified (i.e., subthreshold BN, subthreshold BED, purging disorder, night eating syndrome) and 0.2% of which were unspecified.

Comparisons to the DSM-4-TR equivalent category, EDNOS, are difficult because researchers have differentially operationalized EDNOS (Smink et al., 2012), leading prevalence to be over- and under-estimated depending on the criteria included. In their review, Smink et al. noted one prevalence rate of 2.4% in a nationwide sample of young females, but recognized that this measurement was taken at one point in time rather than providing lifetime prevalence. In a population-based study of the U.S. women, lifetime prevalence rates of EDNOS were 4.78% and 4.64% in adolescents and adults, respectively (Le Grange, Swanson, Crow, & Merikangas, 2012).

Subclinical eating disorders. Researchers consistently have reported higher prevalence rates for subclinical, than clinical, eating disorders (Cohen & Petrie, 2005; Mintz & Betz; 1988; Peck & Lightsey, 2008). In a sample of female undergraduates only 9.6% met full criteria for a clinical eating disorder (e.g., anorexia, menstruating anorexia, bulimia), whereas 39% exhibited symptoms of an eating disorder and were classified as symptomatic/subclinical (Cohen & Petrie,

2005). Tylka and Subich (2002) surveyed 166 high school and college-aged women, finding 51.2% to be symptomatic of an eating disorder (i.e., subclinical), which was more than twice the number who met criteria for a clinical eating disorder (i.e., 21.7%). They also reported a high prevalence in the use of specific pathogenic weight control behaviors: 59.0% skipped meals, 36.7% ate fewer than 1200 calories per day, 30.1% eliminated fats, 27.7% exercised heavily, 26.5% eliminated carbohydrates, 25.9% fasted, 15.7% took appetite suppressants, and fewer than 15% either used powder supplements, diuretics, enemas, laxatives, or vomited after eating.

Summary. Taken together, subclinical disordered eating is far more prevalent than clinical eating disorders and needs to be considered in all prevalence studies to fully understand the extent of these problems. In regards to DSM-5 clinical disorders, initial research shows a wide range of reported prevalence for AN (i.e., 0.8% to 4.2%), BN (0.8% to 2.6%), BED (i.e., 0.1% to 3.6%), and OSFED (i.e., 0.8% to 14.2%). Continued research using DSM-5 criteria may help establish consistency, though will require self-report measures to be retooled to fit the new criteria. Comparisons to DSM-4-TR prevalence rates for each eating disorder category are also inconsistent. Average lifetime prevalence rates of AN and BN using DSM-5 criteria appear to be on the higher end of rates using DSM-4-TR criteria, with the exception of one study (Smink et al., 2014) which found lifetime BN rates to be on the lower end (i.e., 0.8%) in a group of female adolescents (i.e., compared to range of 1.2% to 2.6% in other studies). However, no firm conclusion can be made due to the limited number of studies available, and differences in the populations surveyed of those studies. For example, with the exception of rates of AN, Smink et al.'s study (2014) consistently demonstrated lower prevalence rates of eating disturbance in female adolescents than Stice et al.'s (2013) U.S. sample, which may be due to cultural differences related to body self-image and eating behaviors, frequency in which eating behavior

was assessed (i.e., four total assessments in Smink et al.'s study, eight total assessments in Stice et al.'s study), or operational definitions of eating disorders used in each of the studies.

Disordered Eating Prevalence in Female Athletes

Clinical eating disorders. No published research could be found that has used DSM-5 criteria in samples of athletes, thus data reported here reflects research using DSM-4-TR criteria (unless otherwise noted). In a study that examined 572 female elite Norwegian athletes using a clinical interviews to assess symptomatology, 16.0% were classified as clinically eating disordered; only 9.0% of female controls receiving the same diagnosis (Sundgot-Borgen & Torstveit, 2004). Of the female athletes who met criteria for an eating disorder, 1.9% were categorized as AN, 6.3% as BN, and 7.8% as EDNOS. Another study that examined 522 female elite Norwegian athletes classified 18.0% as clinically eating disordered (Sundgot-Borgen, 1993). In a third separate study of 669 female elite Norwegian athletes ranging in age (13 to 39 years) and sport type (e.g., technical, endurance, aesthetic, weight class), 4.8%, 8.1%, and 19.9% met criteria for AN, BN, and EDNOS, respectively (Torstveit, Rosenvinge, & Sundgot-Borgen, 2008). These studies are notable in that the researchers were able to use clinical interviews to verify eating disorder diagnoses.

In female collegiate athlete samples (Anderson & Petrie, 2012; Carter & Rudd, 2005; Petrie, et. al, 2009a; Greenleaf et al., 2009; Sanford-Martens et al., 2005), rates of clinical eating disorders have ranged from 2.0% to 6.3% when using the Questionnaire for Eating Disorder Diagnosis (QEDD; Mintz, O'Halloran, Mulholland, & Schneider, 1997). For example, in a sample of 442 National Collegiate Athletic Association (NCAA) Division I female athletes representing 21 sports, Petrie et al. (2009a) found that 5.7% (n = 25) met criteria for an eating disorder (1 = bulimia, 24 = EDNOS). The majority (91.7%) of those within the EDNOS

classification exhibited bulimic symptomatology (i.e., 9 = subthreshold BN, 8 = nonbinging BN, and 5 = BED). The remaining 2 athletes were categorized as subthreshold anorexia, which would meet DSM-5 criteria for AN (i.e., all criteria for AN met but maintain menstrual cycle). In a similarly designed and sampled study, 5.1% of the 158 female collegiate athletes who were drawn from 18 NCAA Division I sports were classified as having a clinical eating disorder, though Sanford-Martens et al. (2005) did not provide a breakdown of their specific diagnoses. However, Greenleaf et al. (2009) found a lower prevalence (i.e., 2.0%) among the 204 NCAA-DI female athletes from 17 different sports who met criteria for a clinical eating disorder, all of whom were categorized as EDNOS. Similarly, Carter and Rudd (2005) examined all the female athletes in an NCAA Division I athletic department across two years and found a range of 2.0% to 2.5% who met criteria for a clinical eating disorder in each year; again, all of the athletes were classified with EDNOS. Given that all the studies used the QEDD to determine prevalence, the moderate variability in rates would not be due to differences in measurement, but likely to the athletes who comprised the samples, being drawn from a wide range of sports.

There are two methodological approaches that have been used to address the limitation of including athletes from multiple sports into one sample to assess eating disorder prevalence. First, Hausenblas and Carron (2002) recommended that researchers examine large groups of athletes from a specific at-risk sport (e.g., gymnastics). Second, authors have sampled across sports, but combined those that shared similar qualities, such as identifying sports that are "lean, or "non-lean" and then drawing athletes from the sports that are representative of each category (e.g., Anderson & Petrie, 2012; Beals & Manore, 2002; Sanford-Martens et al., 2005; Torstveit, et al., 2008). For example, Anderson and Petrie (2012) used the QEDD to sample 414 NCAA Division I female athletes from weight sensitive sports (i.e., gymnastics, swimming, and diving),

and found that 6.3% overall met criteria for a clinical eating disorder, all of which were classified as EDNOS. They also separated the sample by sport and found that 6.1% of gymnasts and 6.7% of swimmers/divers had a clinical eating disorder. Using the Bulimia Test-Revised (Thelen, Mintz, & Vander Wal, 1996), Petrie and Stoever (1993) reported a much higher prevalence of bulimia. In contrast, in a sample of 218 NCAA-DI gymnasts, 4.1% were reported as being at-risk for BN using a diagnostic assessment of bulimic symptoms (i.e., BULIT-R; Petrie & Stoever, 1993). Dividing their multi-sport sample into lean (i.e., cross country, gymnastics, swimming/diving, and wrestling) and non-lean (i.e., volleyball, golf, softball, basketball, soccer, and tennis) sports, Sanford-Martens et al. (2005) reported prevalence rates of 3.6% and 5.9%, respectively, for a clinical eating disorder (again, they did not specify actual diagnosis). Similarly, Beals and Manore (2002) compared aesthetic (i.e., cheerleading, diving, and gymnastics) and endurance (i.e., basketball, cross country/track, field hockey, crew, soccer, swimming, and water polo) sports, identifying 5.6% and 3.5% of the athletes, respectively, who met the criteria for a clinical eating disorder. Unlike the other studies that used a psychometric assessment of current eating disorder symptoms, Beals and Manore relied on participant self-report of current or past clinical diagnosis of an eating disorder to determine prevalence. The fact that the frequency of athletes' self-reported symptoms of eating disorders does vary across sport suggests that future research should attempt to limit the number of different sports in a sample or group them according to some meaningful designation (e.g., aesthetic).

Subclinical disorders. Similar to what has been reported with nonathlete samples, higher percentages of athletes endorse symptoms of eating disorders than who meet full diagnostic criteria (e.g., Carter & Rudd, 2005; Greenleaf et al., 2009; Sundgot-Borgen & Torstveit, 2004). One common approach to determining "risk" for subclinical disordered eating behaviors is to use

a cut-off score on measures of disordered eating that fall just below the clinical criterion. For example, in a study of 220 female soccer athletes (i.e., youth elite, collegiate, professional), Prather et al. (2016) used an established measure of disordered eating (i.e., EAT-26) and set a score of "10-19" as the cut-off for determining the athletes who would be at "intermediate risk" (or what other studies would characterize as subclinical). They found that 8.1% of the overall sample of athletes, and 17.8% of the collegiate group, had EAT-26 scores that fell into this range. Prather et al.'s choice to use a score of 10-19 was below the cut-off of 20 that researchers typically use to determine risk of disordered eating attitudes and behaviors. In a mixed-sport sample (e.g., gymnastics, basketball, swimming, golf) of NCAA female athletes, 15.2% were considered to be "at-risk" for an eating disorder based on a cut-off score for the EAT-26 (i.e., EAT-26 $\geq$ 20) or a score from another established measure of disordered eating (i.e., Eating Disorder Inventory-BD [EDI-BD] $\geq$ 12; Beals & Manore, 2002). Another study that employed the EAT-26 examined 56 collegiate female athletes at a Midwestern university from a variety of sports (i.e., soccer, softball, track and field, swimming) and found 14.3% "at-risk" for an eating disorder (i.e., EAT-26 $\geq$ 20; Soubliere & Gitimu, 2012). In a fourth study that utilized the EAT-26 to survey a mixed-sport (i.e., basketball, softball, track/cross country, volleyball, soccer, tennis, swimming/diving, ice hockey) and mixed-division sample of 118 NCAA female athletes, 49.2% of Division I athletes and 40.4% of Division III athletes as "at-risk" for an eating disorder (i.e., EAT-26 $\geq$ 20; Kato et al., 2011).

Similar to studies on clinical EDs, some researchers have used single sport or sport group samples in their research on subclinical disorders. In a study examining 272 female figure skaters using the EAT-26 (i.e., cutoff = 20), 13.2% of elite (i.e., competed at a national or international level) and 13.1% of sub-elite (i.e., never competed beyond local, regional, or

sectional level) were classified as "at-risk" for an eating disorder (Voelker, Gould, & Reel, 2014). In a sample of sample of 84 NCAA-DI female student athletes at a single university, Reinking and Alexander (2005) used the EDI-2 Drive for Thinness Subscale scale (score ≥ 14) as their criterion for determining risk. They found that 7.1% of the total sample, 2.9% of the non-lean sport group (i.e., basketball, volleyball, soccer, field hockey, softball) and 25% of the lean sport group (i.e., swimming, cross country) scored above the cut-off. Although use of the EAT-26 and EDI are easy and popular among researchers for establishing broad classification of risk of disordered eating, the lack of connection between a score and an actual diagnosis limits what the prevalence rates actually represent. Thus, research based on actual diagnostic criteria might provide more accurate representations of the prevalence of subclinical eating pathology.

The QEDD is a self-report measure that is based on actual DSM diagnostic criteria, and studies that have used this assessment have reported prevalence rates of subclinical disorders that range from 14.5% to 26.1% within different samples of female athletes (e.g., Anderson & Petrie, 2012; Carter & Rudd, 2005; Greenleaf et al., 2009; Sanford-Martens et al., 2005). For example, within an entire NCAA-DI student-athlete population at a large university, 17.0% to 19.2% of the female athletes were classified as subclinical across two subsequent years (Carter & Rudd, 2005). In another sample of 489 female collegiate athletes from a variety of sports (e.g., volleyball, gymnastics, golf, track and field), Sanford-Martens et al. (2005) found 14.5% were categorized as subclinical. Among female collegiate swimmers and gymnasts, 26.1% of the athletes were classified as symptomatic (Anderson & Petrie, 2012), which represents one of the highest subclinical prevalence rates reported. Consistent with what has been found using non-athlete samples, female athletes from across multiple sports exhibit a higher frequency of subclinical eating problems than they do behaviors that warrant a clinical diagnosis.

Pathogenic weight control behaviors. Specific pathogenic weight control measures, such as dieting and excessive exercise, have been examined as well among female athletes. In a review that included 15 studies of elite (i.e., at minimum, competing in and/or being part of the national team of their respective country) adolescent athletes from a variety of sports (e.g., rowing, swimming, field hockey, cross country), Werner et al. (2013) examined athletes' weight control attitudes and behaviors relative to non-athletes' and found either no difference between the two groups or lower risk of athletes with weight control concerns. However, elite athletes who competed in lean sports, defined as sports that emphasize leanness or low body weight (e.g., aesthetic, endurance sports), demonstrated either higher or equivalent frequency of weight control behaviors, such as assessed by the EAT-26. In a study of 217 Norwegian elite (i.e., enrolled at one of the Norwegian Elite Sport Schools) adolescent athletes (Martinsen et al., 2010), 11.1% endorsed the use of some form of pathogenic weight control, which included vomiting (8.8%), diet pills (2.8%), laxatives (1.4%), and diuretics (1.4%).

In a study of NCAA D-I female collegiate athletes from 17 different sports (e.g., gymnastics, tennis, cross country, volleyball) Greenleaf et al. (2009) found that the athletes used a range of weight control behaviors, including fasting or maintaining strict diets at least twice in the last year (15.7%), binge eating at least once per week (18.6%), exercising at least 2 hours per day to burn calories (25.5%), vomiting at least 2 to 3 times per month (2.9%), and using diuretics 2 to 3 times per month (1.5%) or laxatives 1 to 2 times per week (1.0%). In a related study, among female athletes from 15 different sports (e.g., diving, gymnastics, basketball, swimming, softball), 67% reported consciously limited food choices (e.g., eliminate red meat, severely restrict fat intake, reduce carbohydrate intake), 42% purposely restricted food intake for the purpose of controlling weight, 6% engaged in binge eating, 11% fasted, 15% maintained low-

calorie diets, 4% used laxatives, 8% used diet pills, and 7% vomited as a means of controlling weight (Beals & Manore, 2002). Furthermore, those female athletes who participated in aesthetic sports (e.g., cheerleading, diving, gymnastics) exhibited significantly more eating pathology and reported greater use of pathogenic weight control behaviors (e.g., low calorie diets, fasting, vomiting, laxative misuse) than those in endurance (e.g., basketball, cross country, field hockey, soccer, swimming) or team sports (e.g., track, golf, softball, tennis, volleyball).

Over a two year period, the female athletes from a large NCAA D-I university, which included sports such as gymnastics, swimming, and volleyball, Carter and Rudd (2005) reported binge eating (6.2% to 7.1%), purging (e.g., fasting, self-induced vomiting; 1.7% to 2.8%), and using diet pills (2.3% to 4.6%) to control their weight. The authors also found that athletes who participated in sports emphasizing a lean physique (e.g., gymnastics, rowing, swimming, volleyball) reported higher rates of pathogenic weight control behaviors (e.g., chronic dieting) than those in non-lean sports (e.g., basketball, field hockey, golf, soccer, softball). In their study of female collegiate athletes from weight-sensitive sports (i.e., swimming, gymnastics, diving), Anderson and Petrie (2012) found that the athletes employed a range of behaviors to control their weight and eating, including: fasting or maintaining strict diets at least once in the last year (gymnasts 18.6%; swimmers/divers 13.4%), binge eating at least once per week (gymnasts 6.1%; swimmers/divers 9.0%), exercising more than 2 hours per day to burn calories (gymnasts 39.3%; swimmers/divers 35.1%), vomiting at least twice per week (gymnasts 2.1%; swimmers/divers 1.5%), and using diuretics at least 3 times per week (gymnasts 1.1%; swimmers/divers 1.5%) or laxatives 2 to 3 times per month (gymnasts 1.8%; swimmers/divers 1.5%). Across all these behaviors there were no significant differences between the gymnasts and swimmers except with respect to the frequency with which they exercised and dieted.

Summary. In female athlete samples, the prevalence of clinical and subclinical eating disorders has ranged from 1.9% to 19.9% and 7.1% to 49.2%, respectively. Studies that included elite athletes have reported rates ranging from to 1.9% to 4.8% for those exhibiting symptoms of AN, 6.3% to 8.1% for BN, and 7.8% to 19.9% for EDNOS. Collegiate athletes appear to meet criteria for EDNOS more often than either AN or BN. Rates of EDNOS have ranged from 2.0% to 6.3%, depending on the athletes sampled, and the subtype of EDNOS primarily has been subthreshold BN. Factors that likely contribute to the variability in prevalence rates include the type of assessment measure employed (i.e., clinical interview, diagnostic assessment, assessment of attitudes and behaviors) and sampling differences (e.g., multi-sport vs. single sport or sport type, level of competition, age of athletes). Studies that have used more strict diagnostic criteria for determining clinical status generally have found lower (and more consistent) rates.

Female athletes more commonly engage in binge eating and individual pathogenic weight control behaviors than the sets of behaviors/symptoms that would qualify them for actual clinical diagnoses. In these behaviors, athletes tend toward the use of dieting and exercising as opposed to more extreme measures (e.g., vomiting, diuretic, or laxative misuse) to control their weight. Collegiate female athletes, particularly those who participate in sports that are weight sensitive or emphasize a lean physique (e.g., gymnastics, swimming, cross country), may be at increased risk for disordered eating and pathogenic weight control behaviors. Dieting and exercising to control weight may be preferred by athletes because they are naturally part of the sport environment (and thus do not stand out as pathological or abnormal), may be reinforced by coach expectations, and likely do not have the immediate potential detrimental effects that vomiting or laxatives might. For example, athletes who engage in restrictive diets or exercise in addition to their regular sport practices may be applauded by coaches or may even see initial

improvements in their performances that result from weight loss or additional training effects. Over time, though, even these behaviors may become problematic for the athletes as they begin to have insufficient energy to maintain their sport performances and/or experience fatigue from all the additional training they are doing. In either case, these behaviors, like vomiting or laxative use, can be detrimental to the athletes' health, performance, and well-being.

Retirement from Collegiate Sport

The transition out of collegiate sport can be exciting and full of opportunity, but also may be perceived as daunting, scary, and distressing as athletes experience a loss of identity that may be difficult to reconcile. In response to popular and anecdotal literature detailing athlete retirement characterized by both trauma and success, Taylor and Ogilvie (1994) developed a conceptual model of the quality of athlete retirement. Incorporating theoretical, empirical, and anecdotal factors that span the full developmental course of retirement, they posited that the quality of adaptation is impacted by causes of retirement (i.e., age, deselection, injury, free choice), factors related to adaption (i.e., developmental experiences, self-identity, perceptions of control, social identity, tertiary contributors), and available resources (e.g., coping skills, social support, pre-retirement planning). In turn, one's quality of adaption results in either healthy career transition, or, retirement crisis (i.e., psychopathology, substance use, occupational problems, family/social problems). When the latter occurs, Taylor and Ogilvie have advocated for purposeful intervention with the athlete. Ogilvie and Taylor recognized that more causes of retirement exist than those included in the model, but noted age, deselection, injury, and free choice as those most commonly cited. One factor related to adaptation is developmental experience, which includes the experiences athletes accrue during their tenure in sport that impact their interpersonal skills and self-perception (e.g., youth programs' emphasis on winning

can lead to issues with self-esteem when deselection occurs). Additional factors related to adaptation are the degree to which athletes identify with and attribute their self-worth to their participation and achievement in sport (i.e., self-identity), and their willingness to diversify their social identity (e.g., family member, friend, student). Perceived control of one's decision to retire, as well as personal, social, and environmental tertiary factors (e.g., socioeconomic status), are other factors related to retirement. Athletes' available resources (i.e., coping skills, social support, pre-retirement planning) can help to circumvent retirement crisis and support healthy adaptation.

Fuller (2014) conducted a qualitative meta-synthesis of the factors that may influence how athletes experience (and respond to) their retirement from collegiate sport. His investigation corroborated previous research findings (e.g., Erpic, Wylleman, & Zupancic, 2004; Fuller, 2014; Grove, Lavallee, & Gordon, 1997; Kerr & Dacyshyn, 2000), identifying the following factors that can strongly impact retirement, including: alignment with one's athletic identity, anticipation of and preparation for retirement, willingness to branch outside of athletics (e.g., diversify social identity, engage in career planning, find new competitive outlets), satisfaction with athletic career, loss of camaraderie, and degree of social support. Those athletes who had a highly salient athletic identity, experienced unanticipated retirements (e.g., retired because of injury), struggled to branch out or expand their social identities (to include roles such as athlete, student, child), were unsatisfied with their athletic careers because they failed to achieve their goals, feared alienation from teammates and the camaraderie formed upon retirement, and lacked social support were likely to experience challenging transitions upon their retirement from sport. Fuller suggested that athletes who coped more effectively with the transition from sport employed strategies such as anticipating and preparing for their retirement, developing an identity and

supports outside of athletics, and pursuing supportive programming (e.g., networking events with former athletes, career planning).

Even for athletes who have prepared, but particularly for those who have not, the transition out of sport can be associated with psychological distress and a drop in overall well-being (e.g., Fuller, 2014; Kerr & Dacyshyn, 2000; Warriner & Lavallee, 2008), including depression (Simon & Docherty, 2014), feelings of emptiness (Stephan, 2003), emotional and social maladjustments (Grove et al., 1997), and eating and body image concerns (Kerr & Dacyshyn, 2000). One study (Stephan et al., 2003) examined the subjective well-being of 16 Olympic athletes who retired following the Sydney Olympic Games during the first year of their career transition. The authors found that the athletes generally demonstrated an initial decline in subjective well-being, citing difficulties in adjusting to a new sedentary lifestyle and confronting a new type of "professional" identity. The athletes acknowledged employing avoidance tactics, such as investing in new activities and going out with friends after work, to combat feelings of boredom and inactivity. However, within about 5 to 6 months following retirement, their reported well-being increased as the former athletes indicated feeling a sense of competence and accomplishment in their new professions and control of reconstructing their lives outside of sport. These results suggest that athletes' experiences of, and reactions to, their retirement from sport are dynamic.

In addition to battling feelings of emptiness and boredom, athletes can also experience eating and body-related issues upon retiring from sport (e.g., Kerr & Dacyshyn, 2000; Papathomas & Lavallee, 2014; Stirling et al., 2012; Warriner & Lavallee, 2008). For example, Kerr and Dacyshyn (2000) interviewed seven retired elite (i.e., national- and international-level) female gymnasts about their retirement experiences, five of whom described their transitions as

difficult. Common concerns included feelings of disorientation, having a void in their lives, negative affect (i.e., feelings of loss of control, frustration), and identity confusion. The gymnasts indicated that even when the choice to retire was voluntary, they still experienced difficulties in the transition. Further, preoccupation with appearance and body throughout their time as competitors, such as an emphasis on body shape and regular monitoring of weight by coaches and sport officials, influenced how they felt about their bodies in retirement. Despite gaining actual, and psychological, control over their weight and body size, the athletes continued to report body dissatisfaction and constant self-monitoring, with two women acknowledging that their preoccupation with weight worsened upon retirement. Warriner and Lavallee (2008) interviewed a different seven retired international-level elite female gymnasts (4 artistic, 3 rhythmic), six who reported adjustment difficulties that included loss of identity and two who indicated that physical changes (e.g., weight gain) worsened upon retirement. The rhythmic gymnasts within the group said they continued to feel the need to control their diet and appearance even during retirement, acknowledging their internalization of the sport culture's extreme emphasis on thinness. One of these gymnasts reported having had a two-year battle with BN, which she attributed to the emphasis on thinness while competing in her sport. Thus, even when removed from the sport environment, athletes report experiencing difficulties in managing their eating and weight and distress associated with their body image.

In an effort to comprehensively understand the nature of eating and body-related concerns experienced upon retirement, Stirling et al. (2012) interviewed eight retired elite gymnasts about their body satisfaction and use of weight control behaviors. All the gymnasts described changes in body composition that they found distressing, including weight gain, loss of their "competition body," and loss of muscle mass and physical strength. The athletes attributed

physique changes to indulgence in foods that were disallowed while competing, less restrictive eating, and decreased physical activity. They also reported increased body dissatisfaction that resulted from negative body image, guilt about changes in body composition, and internalization of weight pressures in the sport environment (i.e., previous pressures to lose weight, continued identification as an athlete, belief that thinness reflects success). Though none of the retired gymnasts reported having a current clinical eating disorder, the majority (n = 7) employed weight control behaviors because of their increased body dissatisfaction, including restricted food (n = 6), counted calories (n = 3), used laxatives or diet pills (n = 4), and exercised excessively (n = 7). These athletes' experiences suggest that weight and appearance pressures from the sport environment do not immediately remit upon retirement and actually may carry forward and continue to cause distress.

In a life history analysis of a female athlete (i.e., basketball and netball player) who engaged in self-starvation, Papathomas and Lavallee (2014) found that she initially began to restrict her eating in an attempt to improve her performance. Despite her subsequent withdrawal from sport and the removal of the direct pressure from her training environment about her weight and eating, her restricting behaviors actually worsened rather than improved, suggesting that transition out of sport did not immediately provide relief. The authors suggested that the worsening of eating behaviors likely resulted from the athlete's achievement orientation and use of restrictive eating for both achievement (i.e., to circumvent failures incurred through both sport and academics) and punishment (i.e., for failing in sport and academics). In a similar study with a male athlete who developed bulimia in his pursuit of elite football performance, Papathomas and Lavallee (2006) indicated that achievement threats and weight-based performance pressures influenced the development of the athlete's bulimia. However, when sport pressures were

removed due to his transition from an elite football program to a less competitive university program, the athlete's eating disorder remained. In his transitional year moving from secondary education to university, the athlete reported that his cycles of binging and purging actually worsened, despite the ending of football season and university preparatory exams. It was not until the athlete incurred an injury that withdrew him from the sport, enabling him to seek treatment, that he was able to recover. These life narrative analyses provide a rich description of the athletes' experiences as they developed and coped with their body image and eating concerns and further exemplify that the transition from sport is complex and may be fraught with psychological distress and decreases in well-being across many life areas.

Summary

Healthy career transition out of sport is possible for many, particularly when athletes participate in pre-retirement planning, maintain important social supports, and engage in adaptive coping (e.g., cognitive restructuring, goal-setting; Taylor & Ogilvie, 1994). However, those athletes with highly salient athletic identities, who have maintained a relatively singular identity as an athlete (as opposed to diverse identities, such as student, friend, child), and who perceive control of their lives to be outside of themselves are at risk for experiencing distressing retirements. Other factors can affect the transition process as well, such as causes of retirement, socioeconomic concerns, and developmental experiences throughout their athletic careers. It seems that those athletes who establish themselves outside of athletics, through their identity, social networks, or alternative hobbies and careers, are able to cope more effectively, and may be more equipped to combat mental health concerns such as depression, feelings of emptiness and loss, and eating and body image concerns.

Qualitative research studies have indicated that retired athletes, particularly female, may struggle with body image and eating concerns (Kerr & Dacyshyn, 2000; Papathomas & Lavallee, 2014; Stirling et al., 2012; Warriner & Lavallee, 2008), regardless of their reasons for retiring. Research on retired elite gymnasts (e.g., Kerr & Dacyshyn, 2000; Stirling et al., 2012) demonstrates that most are dissatisfied with their bodies, and many experience a continuation (or even worsening) of their pathogenic eating behaviors (e.g., controlled and restrictive eating practices, bulimic behaviors, excessive exercise). Though these qualitative investigations have offered a rich description of the development, and progression, of disordered eating attitudes and behaviors (during and after sport participation has ended), they are limited in generalizability and replicability (Papathomas & Lavallee, 2006). Additionally, the authors did not diagnostically investigate the extent of the athletes' eating concerns, such as with a clinical interview or diagnostic measure of disordered eating (e.g., QEDD), and the studies were of singular cases or a limited number of participants from the same sport (e.g., Papathomas & Lavallee, 2014; Stirling et al., 2012). Furthermore, Stirling et al. (2012) acknowledged that the participants' recollections of past eating behaviors and the sport environment might have been skewed either positively or negatively. Thus, further research is needed that quantitatively examines athletes' disordered eating behaviors both during their tenure as athletes and in retirement. Employing such longitudinal methods will help to elucidate the progression, maintenance, and/or reduction in disordered eating behaviors and enable researchers to understand the course of these disorders (and related symptoms/behaviors) among female athletes.

Longitudinal Examinations of Eating Disorders

Although not a traditional longitudinal study in which the same sample was followed over time, Sungot-Borgen and Torstveit (2010) did examine how the prevalence of eating

disorders changed from 1990 to 2002. Using existing data from comparable samples of female elite athletes that they had collected and reported on during 1990-1991 (Sundgot-Borgen, 1993), 1997-1998 (Sundgot-Borgen & Torstveit, 2004), and 2001-2002 (Torstveit et al., 2008), they determined how the frequency of specific eating disorder diagnoses changed across the 10-year span. Prevalence rates of athletes considered at-risk for an eating disorder varied, ranging from 22.4% in 1990-1991, to 21.2% in 1997-1998, to 60.1% in 2001-2002. However, the authors' definitions of risk varied for each data collection, operationalized through the use of two cut-off scores, the Eating Disorder Inventory subscales Drive for Thinness (i.e., EDI-DT > 15) and Body Dissatisfaction (i.e., EDI-BD > 14) in the first study (Sundgot-Borgen, 1993); the two cut-off scores, a positive response to two or more DSM-4-TR criterion, and/or self-reported eating disorders in the second study (Sundgot-Borgen & Torstveit, 2004); and the two cut-off scores, self-reported eating disorders, pathogenic weight control methods, low body weight, menstrual dysfunction, and stress fractures in the third study (Torstveit et al., 2008). Female athletes who met criteria for a clinical eating disorder, which was determined through standardized clinical interviews of eating disorder criteria per DSM-4 with randomly selected samples of the athletes, also varied over the course of the three studies, ranging from 20.0% in 1990-1991, to 21.5% in 1997-1998, to 28.1% in 2001-2002. Although these data suggest an increase in the prevalence of elite female athletes who were at-risk as well as those who met the criteria for a clinical disorder over time, the authors acknowledged that the higher rates in the 2001-2002 might not actually reflect a change in frequency but rather be the result of a methodological artifact, specifically (a) the inclusion of more criteria that would identify athletes as being at-risk, or (b) increased individual and societal awareness of disordered eating behaviors among the athletes. As noted

previously, a major limitation of this study was the lack of a single sample of female athletes that was compared over time.

Another study (Thompson, Petrie, & Anderson, under review) examined the prevalence of disordered eating and weight control behaviors in 325 female collegiate gymnasts, swimmers, and divers at the beginning of their competitive seasons (Time 1), and again in the final two weeks of their seasons before their conference championships (Time 2). They found that the number of athletes classified as eating disordered increased over the course of the season from 20 (6.2%) to 24 (7.4%). For the 83 (25.5%) athletes who were subclinical at Time 1, 43 (51.8%) became asymptomatic/healthy, 31 (37.3%) remained symptomatic/subclinical, and nine (10.8%) became clinically eating disordered. Of concern is the fact that 90% of the athletes who were originally classified with a clinical eating disorder maintained some level of eating disturbance (i.e., remained clinical or moved to subclinical) at Time 2. The most common weight control behaviors were dieting and exercise, though more athletes reported use of these behaviors at Time 1 (dieting 4 or more times per year = 12.3%, exercise two or more hours per day to burn calories = 42.5%) than at Time 2 (dieting 4 or more times per year = 9.2%, exercising two or more hours per day to burn calories = 35.4%). This study indicates that, for the asymptomatic and clinical eating disorder groups, there was relative stability in their original classification over a competitive season. Significant changes, however, occurred among the athletes originally classified as subclinical, with over half improving to become asymptomatic and the other half either sustaining or worsening symptomatology to become clinically eating disordered. Research that employs a similar design but examines eating behaviors outside of a competitive season will be important to further understand the influence of sport on athletes' experiences of eating disorders.

A one-year intervention-based study by Martinsen et al. (2014) sampled 16 Norwegian Elite Sport High Schools, which included 291 female athletes who fully participated in the study (i.e., completed pretest, posttest 1 completed one year after pretest, and posttest 2 completed one year after posttest 1). The schools were stratified and randomized into either a control (n = 7) or intervention (n = 9) group, which included a 1-year program with the goals of reducing disordered eating symptoms and preventing the development of eating disorders in young elite athletes. Participants completed the Eating Disorder Inventory at each data collection, and eating disorder classification was determined through the use of a structured clinical interview (i.e., Eating Disorder Examination) at pretest and posttest 2. Since they were not exposed to the intervention, the control group provides an opportunity to see the natural development of disordered eating over time. At pretest, 15.3% of the control group met criteria for a clinical eating disorder; two years later at posttest 2, this number grew to 20.8%. Of the female athletes who were deemed "healthy" (i.e., did not meet risk classification or eating disorder classification) at baseline in the control group, eight (13.1%) became clinically eating disordered at posttest 2, whereas none of the 87 healthy athletes in the intervention group became so. Similar to Thompson et al. (under review), this study suggests that with purposeful intervention, eating disorders may be treatable and preventable in young elite athletes, but without it, disordered eating may remain or worsen. Additionally, the frequency of eating disorder prevalence rose over the course of the study in the group without intervention, indicating that the frequency of eating disorders can indeed worsen in an adolescent athlete sample over a year's time.

Research with nonathletes have used longitudinal methodologies to examine changes in the prevalence of disordered eating behaviors and are informative for studies with athletes. For

example, Stice, Marti, and Rohde (2013) followed the same group of 496 adolescent girls over an eight year span. By the eighth year of the study, when the women were on average 21 years old, the authors determined that, at some point over the course of the study, 32.1% of the women had experienced a form of a clinical eating disorder (AN = 0.8%, BN = 2.6%, BED = 3.0%, unspecified eating disorder = 11.5%, atypical AN = 2.8%, subthreshold BN = 4.4%, subthreshold BED = 3.6%, purging disorder = 3.4%). They also examined eating disorder progression (i.e., transition from subthreshold to threshold of the same disorder) or diagnostic crossover (i.e., conversion from one eating disorder category to another) over the eight years of the study. Of the girls initially diagnosed with subthreshold BN (n = 22), seven progressed and were later classified with BN. Additionally, five participants' presentations of subthreshold BED intensified to become clinically significant BED as well. The most common crossover occurred from subthreshold BN to BED (23%), from subthreshold BED to subthreshold BN (22%), from subthreshold BED to BN (22%), and from BED to subthreshold BED (33%); lowest crossover was for AN (0%) and atypical anorexia (2%). Thus, crossover between disordered eating categories was most common for those presenting with BN- or BED-related behaviors. The authors also reported that, within one year of their diagnoses, recovery rates of 75% for AN, 100% for BN, 93% for BED, 89% for unspecified eating disorders, and 93% for specified eating disorders. Recovery may have been facilitated by mental health treatment for some; those with AN, BN, BED, and subthreshold BN reported significantly greater mental health treatment (i.e., defined by frequency of visits in the past 6 months to any type of mental health care provider) than the non-eating-disordered participants. These results indicate that eating disorder classifications do change over time, particularly during the course of adolescence. Although an important study for understanding the potential progression of eating disorders, this study was

limited in that participants who met criteria for an eating disorder were given referrals and encouraged to seek treatment, which may have shortened the duration of eating pathology.

In a related study, Holland, Bodell, and Keel (2013) sampled male and female university students (all nonathletes) during the springs of 1982 and 1992, and then reassessed each group separately ten years later (i.e., either in 1992 or 2002). The sample included 949 women, 14.3% of who were categorized as having a clinical eating disorder at baseline (i.e., AN = 0.6%, BN = 2.7%, EDNOS = 11.0%). At the follow-up assessment, only 5.0% (n = 48) of the women were diagnosed with a clinical eating disorder, 2.3% (n = 22) who were eating disordered at baseline and 2.7% (n = 26) who were not. Thus, 97% of the women who were not eating disordered at baseline remained so at follow-up, and 16% of those who were eating disordered at baseline maintained their eating disorder status; 17% of the original sample ended up developing an ED at some point over the course of the 10 years.

In sum, the results of the Holland et al. (2013) study suggest that the prevalence of clinical eating disorders is highest when the participants are younger (i.e., in college as opposed to young adulthood), clinical eating disorder diagnoses decrease as women move from college into young adulthood, and eating disorders can remit, maintain, or begin over the ten-year period that marks the transition from college to young adulthood. This study, though, was limited by the fact that data collection occurred only twice over a ten-year period, which may have missed changes that occurred between collections. Additionally, because of the timing of the initial data collection, the authors were only able to include five of the eight original EDI subscales, limiting them to three psychological variables as predictors. Despite these limitations, applying this methodology within a female athlete sample would enable researchers to examine change in prevalence over time, and the progression, reduction or maintenance of symptom classification.

Summary

Research with female athletes demonstrates fluctuation in eating disorder status over time. Sundgot-Borgen and Torstveit's (2010) study indicated an increase in athletes with disordered eating levels that were at-risk and clinical over an eleven year period; however, they did not follow the same sample over time. Thompson et al. (under review) found that the prevalence of female athletes who were clinically disordered increased over the course of a competitive season, whereas the subclinical athletes decreased over the same time frame. Additionally, the percentage of athletes who reported using common weight control behaviors (i.e., dieting, excessive exercise) decreased from the beginning to the end of the competitive season. In an intervention-based study (Martinsen et al., 2014) of elite adolescent athletes, the prevalence of clinical eating disorders within young women in the control group, in which a purposeful intervention was not applied, increased. Furthermore, 8 of the athletes deemed "healthy" in the control became eating disordered over time; none became eating disordered in the intervention group.

Longitudinal research with non-athletes has corroborated that clinical eating disorder classification fluctuates over time, including worsening, improving, or transforming (i.e., move from one eating disorder category to another). Such problematic behaviors seem to peak during late adolescence and early adulthood; however, they do not appear isolated to this time period. Further research is needed that quantitatively examines athletes' disordered eating behaviors both during their tenure as athletes and in retirement to help to elucidate the progression, maintenance, and/or reduction in disordered eating behaviors and enable researchers to understand the course of these disorders (and related symptoms/behaviors) among female athletes.

Transitioning from active competition to retirement can result in athletes experiencing psychological distress, loss, identity confusion, and body dissatisfaction. Research indicates that retired athletes may struggle with body image and eating concerns, in particular (e.g., Papathomas & Lavallee, 2014; Warriner & Lavallee, 2008). Retired elite gymnasts have reported increased body dissatisfaction and eating concerns, with some who maintain or worsen problematic eating behaviors in retirement (Kerr & Dacyshyn, 2000; Stirling et al., 2012). The research that is available suggests that athletes experience disturbances in eating behaviors both during active sport competition and following career termination, and that eating behaviors can occasionally worsen at the onset of sport retirement (Papathomas & Lavallee, 2014; Stirling et al., 2012).

The few longitudinal studies that examined disordered eating behavior in athletes over time have done so only while athletes were actively competing (e.g., Martinsen et al., 2014; Sundgot-Borgen & Torstveit, 2010); thus, changes that may occur after retirement could not be assessed. Understanding how eating behaviors transform throughout an athletic career is important, but does not address how sport retirement, a potentially stressful time period for any athlete, might impact eating behavior. Thus, research that quantitatively examines athletes' eating behaviors in relation to sport retirement is needed.

Research Question 1

In the current study I will investigate the prevalence of eating disorder classifications (i.e., clinical eating disorder, subclinical eating disorder, and asymptomatic/healthy eating) and pathogenic weight control behaviors (i.e., binging, vomiting, laxative use, diuretic use, fasting, and excessive exercise) in retired female collegiate gymnasts and swimmers/divers across two time points – the end of their competitive seasons (Time 1) and at a second time point 6 years

later (Time 2) when all will have been retired from their collegiate sport careers for two to six years. Data on Time 1 prevalence has been presented (Thompson et al., under review), so this study will focus on (1) comparing prevalence rates of clinical and subclinical eating disorders between Time 1 and Time 2, (2) comparing prevalence rates for the use of pathogenic weight control behaviors at Time 1 and Time 2, (3) examining progression or reduction of symptoms (i.e., movement between asymptomatic/healthy eating, subclinical eating disorder, and clinical eating disordered categories) between Time 1 and Time 2, and (4) examining diagnostic change or crossover from one disorder to another between Time 1 and Time 2. Based on existing research (e.g., Holland et al., 2013; Thompson et al., in press), I hypothesized that (1) the prevalence rates for the disordered eating groups (i.e., clinical and subclinical eating disordered) will decrease from Time 1 to Time 2, with the primary movement being to healthier eating classification, (2) the prevalence rates of pathogenic weight control behaviors (i.e., binging, vomiting, laxatives, diuretics, fasting, excessive exercise) will decrease from Time 1 to Time 2, and (3) there will be movement or crossover among EDNOS sub-categories (i.e., some of those who were in a bulimic-related category, such as subbulimia, at Time 1 will move to a binge eating-related category at Time 2 and vice versa) from Time 1 to Time 2.

Psychological Predictors of Eating Disorders

In addition to establishing prevalence rates of eating disorders among female athletes, researchers have examined potential psychosocial risk factors in the development and maintenance of these disorders (e.g., Anderson, Petrie, & Neumann, 2012; Petrie et al., 2009a; Petrie et al., 2009b; Voelker et al., 2014). In their sociocultural model of disordered eating in athletes, Petrie and Greenleaf (2012) identified a set of psychosocial factors, including dieting, body dissatisfaction, negative affect (e.g., anxiety, sadness, guilt), perceived pressures (e.g., from

society, parents, coaches, sport environment), and internalization (i.e., internalized belief that one should achieve societal body or appearance ideals), which they believed interacted to increase athletes' risk of expressing disordered eating symptoms. Both cross-sectional and longitudinal studies have been conducted on this question and provide direction for future research.

Cross-sectional studies have found that female athletes who demonstrate some level of disordered eating (i.e., clinical or subclinical) have generally responded similarly on measures of body image, disordered eating and psychosocial well-being (e.g., Anderson, Petrie, & Neumann, 2011; Petrie et al., 2009a; Petrie et al., 2009b). Petrie et al. (2009a) examined the eating behaviors and psychosocial correlates (i.e., weight pressures, mood, internalization, body image concerns) in 442 female collegiate athletes from a variety of sports, 5.7% of who were clinically eating disordered and 18.3% of who were symptomatic/subclinical. They found that those athletes who demonstrated disturbed eating behaviors (i.e., subclinical and clinically eating disordered) responded similarly to one another and differed significantly (and more pathologically) from those who were asymptomatic in terms of perceived weight pressures (i.e., from teammates, parents, friends, significant others, and media), mood (i.e., sadness, anxiety, stress), internalization (i.e., sociocultural attitudes about the importance of being physically fit and in shape), and body image concerns (i.e., satisfaction with overall appearance, overall body, and parts of one's body). A related study by Petrie et al. (2009b) examined the relationship between personality factors and disordered eating in 204 female collegiate athletes. They found that self-esteem, exercising to improve appearance and be more attractive, and appearance orientation significantly differentiated between the disturbed eating group (i.e., subclinical and clinical) and the asymptomatic group; there were no differences on perfectionism, optimism, or exercising for fitness/health. Specifically, athletes were more likely to be in the disturbed eating

group if they reported greater appearance orientation and exercising to be more attractive and lower levels of self-esteem. Thus, research seems to demonstrate that female athletes who show some level of disordered eating behaviors (i.e., subclinical and clinical) respond similarly to most psychosocial correlates, and that differentiation occurs primarily between those who are asymptomatic and eating disordered (i.e., subclinical and clinical).

Another study (Voelker et al., 2014) examined 272 female figure skaters between the ages of 12 and 25 on measures of disordered eating (i.e., EAT-26), weight pressures specific to sport, general and sport-specific body satisfaction, positive (i.e., motivation to achieve goals that promote favorable outcomes) and negative (i.e., motivation to achieve goals that prevent adverse outcomes) perfectionism, self-esteem, and athletic identity. After controlling for the effects of BMI and age in the model, which accounted for 13% of the variance in EAT-26 scores (i.e., the continuous variable reflecting disordered eating), they found that self-consciousness of weight and appearance ($\beta = .42$, $p = .001$), general body dissatisfaction ($\beta = .43$, $p = .001$), sport-specific body dissatisfaction ($\beta = -0.27$, $p = .002$), and positive perfectionism ($\beta = .18$, $p = .001$) were significant predictors. Thus, concerns with appearance and body dissatisfaction seem to consistently correlate with measures of disordered eating in athletes.

Using Petrie and Greenleaf's (2007) original sociocultural model of disordered eating behavior as the grounding framework, Greenleaf et al. (2010) examined the relation of internalization, body satisfaction, dietary restraint, and negative affect to bulimic symptomatology in 204 NCAA-DI female athletes from a variety of sports. They found that, after controlling for BMI and social desirability, the psychosocial variables accounted for 42% of the variance in bulimic symptomatology. More specifically, higher levels of body dissatisfaction, dietary restraint, and guilt were related to increased bulimic symptoms. In a

related study, Anderson et al. (2011) sampled 414 NCAA-DI female gymnasts, swimmers, and divers to test the proposed relations of the Petrie and Greenleaf (2007) model using structural equation modeling. The authors divided the participants in half (i.e., Samples A and B), matched by BMI, to provide an exploratory and confirmatory sample of the proposed model, respectively. In Sample A, the authors found bulimic symptoms were explained by the direct effects (i.e., effect of one variable on another, unmediated by any other variable in the model) of negative affect ($\beta = .26$), body satisfaction ($\beta = -.25$), and dietary restraint ($\beta = .44$), the culmination of which accounted for 55% of the variance in bulimic symptoms. In Sample B, bulimic symptoms were explained by the direct effects of negative affect ($\beta = .14$), body satisfaction ($\beta = -.42$), and dietary restraint ($\beta = .35$), all of which accounted for 58% of the variance in bulimic symptoms. Across the two samples, for bulimic symptoms, the authors found indirect effects (i.e., an effect in which a causal relation was implied between two variables through a mediating variable) with sport pressures through dietary restraint (βs = .29 to .35), and through body satisfaction (βs = .14 to .26); internalization was also indirectly related to bulimic symptoms through body satisfaction ($\beta = .10$) but only with sample A. Thus, those athletes who experienced negative emotions (anger, sadness, fear) were dissatisfied with their body shape, and who restricted their food intake reported higher levels of bulimic symptoms than those who did not. The above studies demonstrate consistency in their findings of the influence of negative affect, body satisfaction, and dietary restraint on the development of bulimic symptomatology.

Research with non-athletes has found similar results in regards to psychosocial factors that are related to measures of disordered eating. In a meta-analytic review of risk and maintenance factors for disordered eating behaviors that was not exclusive to athletes, Stice (2002) found that elevated BMI, body dissatisfaction, negative affect, perfectionism, impulsivity,

and substance use were risk factors of disturbed eating behaviors. Further, he found that perceived pressure to be thin and internalization of the thin-ideal were causal risk factors (i.e., when an experimental increase or decrease of a factor results in individuals who were previously free of diagnostic levels of the disorder result in reduced or elevated symptoms, respectively) of disordered eating behaviors and attitudes. Thus, it seems that negative affect and body dissatisfaction pose risk for the development of eating pathology in both the general population and the athletic arena.

Although cross-sectional methodologies are useful for identifying correlates, they fall short in not being able to determine if a variable is an actual risk factor (Stice, 2002). Longitudinal designs are necessary for making such a determination and researchers have begun to address this question in studies with female athletes. One study (Doughty & Hausenblas, 2005) examined drive for thinness, body dissatisfaction, and perfectionism in 72 NCAA-DI female gymnasts at two time points during the athletes' competitive season, once during the athletes' preseason (Time 1) and a second time during a specified two-week period of their competitive seasons. The authors found no significant differences in the athletes' responses across the two data collections, suggesting that the aforementioned traits remained relatively stable over time. They did not, however, examine potential relations between the variables, such as whether Time 1 levels of body dissatisfaction might predict Time 2 drive for thinness. Using a more sophisticated statistical approach (i.e., cross-lagged panel analysis), Anderson et al. (2012) used a sample of 325 NCAA-DI female gymnasts, swimmers, and divers to examine the relations among sport pressures to achieve a certain body shape, body satisfaction, and intent to diet or restrict food intake at two different time points – within the first two weeks of their competitive seasons (Time 1) and again in the final two weeks of their seasons just before their conference

championships (Time 2). Like Doughty and Hausenblas (2005), they found relative stability across time on the athletes' experience of sport pressures and intent to diet, with each Time 1 factor explaining 62% and 64% of their Time 2 variances, respectively; body satisfaction, however, demonstrated more variability across time, only explaining 44% of its Time 2 variance. With regard to the predictive validity of the Time 1 measures, sport pressures about body and weight that the athletes reported experiencing predicted decreases in their Time 2 body satisfaction (β = -.26, p < .01), even after accounting for the athletes' body satisfaction at Time 1. Though these studies provide insight into the maintenance of relevant psychosocial constructs in the formulation of disordered eating, the data collections only spanned a competitive season. Thus, the results are limited to that time frame and cannot speak to the trajectory of these variables outside of the athletes' competitive seasons.

In a related study, Krentz and Warschburger (2013) used a one-year time frame in which to examine changes in the responses of 65 (male and female) German elite (i.e., members of elite sports schools and Olympic training centers) adolescent aesthetic sport athletes from a variety of sports, including gymnastics, figure skating (ice and roller-skate), diving, ballet, and rhythmic gymnastics. The authors assessed the athletes at two time points, one year apart, on a measure of disordered eating (i.e., EAT-26), distress from missed exercise, sports-related body dissatisfaction, desire to be leaner for sport, and pressures from the sport environment. The majority of the female athletes' responses remained relatively stable over time, which included disordered eating attitudes and behaviors, distress from missed exercise, sports-related body dissatisfaction, and desire to be leaner for sport. Only one variable changed; social pressure from the sports environment increased significantly (η^2 = .13) between time points. Additionally, the authors found that the Time 1 psychosocial factors (i.e., distress from missed

exercise, sports-related body dissatisfaction, desire to be learner for sport, pressures from the sport environment) explained 31% of the variance in Time 2 disordered eating scores. The results of this study again reflect relative stability of psychosocial factors related to disordered eating.

Using cross-lagged panel analysis to identify predictors of changes in disordered eating over time, Voelker et al. (2016) examined body satisfaction, dietary restraint, negative affect and bulimic symptomatology in 325 NCAA-DI female gymnasts, swimmers, and divers. The athletes completed measures of these constructs at the beginning (Time 1) and end (Time 2) of their athletic seasons, which spanned approximately five months. They found high stability in self-reported intentions to restrain their diets and bulimic symptomatology over the course of the season, with Time 1 scores predicting 66% and 64% of the variances in the athletes' Time 2 scores, respectively; less stability was seen in the athletes' negative affect and body dissatisfaction scores (i.e., 29% and 44%, respectively). Contrary to their hypotheses, Time 1 negative affect, body satisfaction, and self-reported intent to diet did not significantly predict Time 2 levels of bulimic symptomatology, which the authors suggested might have been due to the short time-frame in which the data was collected. They did find, however, several significant relations among the Time 1 to Time 2 variables (all effects were after controlling for the Time 1 variable scores in the outcome variable): (a) Time 1 negative affect ($\beta = -0.12$, $p < .05$) predicted decreases in Time 2 dietary restraint; (b) Time 1 bulimic symptomatology ($\beta = -0.19$, $p < .01$) predicted decreases in body satisfaction at Time 2; and (c) Time 1 body satisfaction ($\beta = -0.23$, $p < .01$) predicted decreases in negative affect at Time 2. These results suggest that dietary restraint and bulimic symptomatology remain relatively stable throughout athletes' competitive

seasons, but that psychosocial variables, such as negative affect and body satisfaction, can significantly predict changes in levels of other psychosocial variables in a short time frame.

In total, the results suggest general stability among disordered eating attitudes and behaviors (e.g., bulimic symptomatology, body satisfaction, dietary intent) over time. Pressures from the sport environment (e.g., from parents, teammates, coaches) may in fact increase over time, making female athletes that experience such pressure more vulnerable to the onset or maintenance of disordered eating behaviors. However, the authors acknowledged limitations with their studies, which included short durations (i.e., ranging from 5-12 months), suggesting that perhaps this time frame did not provide a sufficient window in which to view the development of these variables. More research is needed that incorporates each of these variables and examines their predictive influence of disordered eating. Future studies should follow large samples over a sufficient period of time in which to view the development of these psychosocial factors and disordered eating behaviors. Additionally, facilitating more than two data collections might help to demonstrate how the variables fluctuate over time.

Studies with non-athlete samples (e.g., Holland et al., 2013; Stice, 2016) have also examined psychological predictors of eating disorder onset and maintenance and provide a useful paradigm for examining similar issues in samples of athletes. For example, in Holland et al.'s (2013) 10-year prospective study, the authors found that for the men and women who were not categorized as eating disordered at baseline, higher levels of perfectionism and maturity fears and lower levels of interpersonal distrust predicted the presence of an eating disorder at follow-up. Alternatively, only higher levels of perfectionism significantly predicted the maintenance of an eating disorder at follow-up. Thus, this study provided evidence that perfectionism, maturity fears, and interpersonal distrust influence patterns of disordered eating behaviors. However,

because data collection occurred prior to the standardization of the EDI, their study was limited in the scope of the predictors that could be examined.

Stice (2016) completed a review of prospective studies that examined predictors of eating disorder onset. Although none of the studies were conducted with athletes, samples generally were comprised of female adolescents and young adult women. He reported that low BMI was the most frequent predictor of future development of subthreshold or threshold AN, followed by perfectionism and impaired psychosocial functioning over time periods that ranged from three years to lifetime. Dieting, thin-ideal internalization, body dissatisfaction, negative affect, and fasting were the most consistent predictors for onset of subthreshold or threshold BN, with follow-up assessments ranging from one to seven years. Stice also reviewed prospective studies of risk factors for the development of any eating disorder, and found that body dissatisfaction, negative affect, thin-ideal internalization, perceived pressure for thinness, dieting, and deficient family support were the most consistent predictors of future disordered eating for time periods ranging from one to four years. In sum, the results from Stice's review indicate that risk factors for any eating disorder are more similar to risk factors for BN and BED than for AN, which he suggested might be explained by higher incidence rates for BN and BED than for AN (thus risk factors for 'any eating disorder' will be more similar to those eating disorders that have higher incidence rates, i.e., BN and BED over AN). Though Stice provided a thorough review of influential risk factors of future disordered eating onset, his study is limited by its examination of participants who did not meet criteria for an eating disorder at baseline. Thus, the psychosocial risk factors established can be applied to hypotheses in which individuals are asymptomatic or symptomatic of an eating disorder at baseline, but not to those who were eating disordered at baseline and understanding how their eating behaviors may evolve over time. More research is

needed that employs a prospective design and applies these established psychosocial variables (i.e., internalization, dieting, body dissatisfaction, negative affect, perceived pressure) to those with and without disordered eating present at baseline to determine what best predicts change.

Research Question 2

My second question addresses what are the longitudinal relations of the psychosocial variables to the maintenance to eating disorder classification. Specifically, I will examine the Time 1 psychosocial constructs of BMI, body dissatisfaction, negative affect, thin-ideal internalization, dietary restraint, and perceived general sociocultural pressures as predictors of Time 2 eating disorder classification. I hypothesize that those with high BMI (i.e., non-normal), high body dissatisfaction, high negative affect, high thin-ideal internalization, high dietary restraint, and high perceived pressures at Time 1 will have greater odds of being classified as symptomatic (as opposed to asymptomatic) at Time 2.

Method

Participants

Participants will be 193 retired NCAA Division I female athletes (gymnasts = 122; swimmers/divers = 71) who were drawn from 26 different programs. Mean age was 25.75 years (*SD* = 1.18; range = 24 to 29 years) at Time 2. In terms of racial/ethnic group status, 171 (88.6%) were White/Caucasian, 7 (3.6%) Black/African American, 1 (0.5%) Hawaiian/Pacific Islander, 8 (4.1%) Asian American, 4 (2.1%) Biracial, and 2 (1.0%) who identified as "Other." Of the participants, 46 (23.8%) reported they were single, 103 (53.4%) reported they were in a romantic relationship, 42 (21.8%) were married, and 2 (1.0%) were divorced.

Based on their Body Mass Indexes (BMI; Centers for Disease Control and Prevention [CDC; n.d.]) the athletes were: underweight (BMI < 18.5: Time 1, *n* = 3, 1.6%; Time 2, *n* = 5,

2.6%), normal weight (BMI 18.5-24.99: Time 1, *n* = 170, 88.1%; Time 2, *n* = 165, 85.5%), or overweight (BMI > 25: Time 1, *n* = 20, 10.4%; Time 2, *n* = 23, 11.9%). Participants' mean BMI was 22.64 kg/m^2 (*SD* = 2.06; Time 1) and 22.32 kg/m^2 (*SD* = 2.81; Time 2). Retirement from sport years ranged from 2007 to 2013, with the athletes retiring in 2007 (*n* = 2, 1.0%), 2008 (*n* = 1, 0.5%), 2009 (*n* = 37, 19.2%), 2010 (*n* = 56, 29.0%), 2011 (*n* = 49, 25.4%), 2012 (*n* = 42, 21.8%), and 2013 (*n* = 3, 1.6%).

Instruments

Demographics. The athletes provided general demographic material, including information such as age, race/ethnicity, relationship status, height, and weight.

Disordered eating. The Questionnaire for Eating Disorder Diagnoses (QEDD; Mintz et al., 1997) is a 50-item self-report measure whose responses were used to classify the athletes based on criteria from the DSM-4-TR (APA, 2000) as: (1) clinical eating disorder [i.e., anorexia nervosa, bulimia nervosa, or eating disorder not otherwise specified (ED-NOS), which includes menstruating anorexia, subthreshold bulimia, nonbinging bulimia, and binge-eating disorder], (2) subclinical eating disorder (i.e., demonstrates symptoms of disordered eating but do not meet criteria for a diagnosis), and (3) asymptomatic according to the criteria stipulated by the measure. Research has shown the QEDD is a reliable tool that has demonstrated one to three month test-retest reliabilities, with kappa values ranging from .54 to .85, for clinical eating disorder, subclinical, and asymptomatic groups (Mintz et al, 1997). Additionally, the authors found an accuracy rate of 98% between the QEDD and clinician diagnoses of eating disorder categories. Further, studies have demonstrated its utility in classifying female athletes as clinically eating disordered, subclinical, and asymptomatic (Carter & Rudd, 2005; Greenleaf et al., 2009; Sanford Martens et al., 2005).

Weight control behaviors. Seven items from the 36-item Bulimia Test-Revised (BULIT-R; Thelen et al., 1996) were used to asses the frequency and duration in which the athletes have participated in binge eating, and the frequency with which they have used each of the following weight control methods: laxatives, exercising to lose weight, vomiting, dieting/fasting, and diuretics. For each item, such as, "I exercise in order to burn calories," athletes responded on a 5-point scale that ranged from 1 (*least frequent use*) to 5 (*most frequent use;* the scale indicating the frequency of each behavior varied slightly). These items have been used in previous research with female collegiate athletes to assess frequency of weight control behaviors (e.g., Greenleaf et al., 2009; Voelker et al., 2016).

Body satisfaction. The 12-item Body Parts Satisfaction Scale-Revised (BPSS-R; Petrie, Tripp, & Harvey, 2002) assesses satisfaction through ratings of different body parts (e.g., hair, overall face, upper thighs). Items load on two factors (Body – seven items; Face – four items) and one item provides an assessment of overall satisfaction with body and muscle tone. The women rated their satisfaction over the past three months on a scale that ranged from 1 (*extremely dissatisfied)* to 6 (*extremely satisfied*). The total score for each of the factors is the mean of the respective items; higher scores indicate greater satisfaction. Petrie et al. (2009a) reported Cronbach's alphas of .90 and .73 for body and face, respectively, in mixed-sport sample of female collegiate athletes; alphas for the current study were .90 and .75, respectively. Petrie et al. (2002) has provided extensive information about the scale's construct validity.

Negative affect. Participants completed 23 items from the Positive and Negative Affective Schedule-Extended version (PANAS-X; Watson & Clark, 1992), which assessed the extent to which they experienced various emotions (e.g., fear, anger, guilt) on average over the previous three months. The women rated their experience of emotions on a 5-point Likert scale,

ranging from 1 (*very slightly/not at all*) to 5 (*extremely).* A mean total score is derived for each affective state; higher scores indicate stronger negative mood. The PANAS-X has been shown to be a valid and reliable measure of negative affect, showing convergence with the Profile of Mood States (POMS) ranging from .85 to .91 and two-month test-retest reliabilities ranging from .64 to .71 (Watson & Clark, 1992). Tylka and Wilcox (2006) reported Cronbach's alpha of .87 with a sample of female undergraduate students; alphas for the current study ranged from .85 to .93. It has previously been applied with female athletes to evaluate general mood states (e.g., Anderson et al., 2011; Voelker et al., 2016).

Internalization. The 14-item Sociocultural Attitudes Toward Appearance Questionnaire-3 (SATAQ-3; Thompson, van den Berg, Roehrig, Guarda, & Heinberg, 2004) assesses general and athlete specific aspects of internalization of messages about beauty, attractiveness, and body size/shape and messages related to an ideal athletic appearance, respectively. For each item, such as, "I care if my body looks like the people on TV and in the movies," the women responded on scale that ranged from 1 (*definitely disagree*) to 5 (*definitely agree).* Total score for each factor is the mean of those items; higher scores indicate greater internalization of those appearance ideals. Warren et al. (2013) reported Cronbach's alphas ranging from .96 to .98 and .89 to .99 for the general and athletic subscales, respectively, in a sample of diverse American university women separated by ethnicity; alphas for the current study were .91 and .81, respectively. Thompson et al. (2004) provided support for the scales' validity by reporting correlations with Eating Disorder Inventory subscales that ranged from .17 to .55. These scales have been used in past research of female athletes to measure internalization (e.g., Anderson et al., 2011).

Dietary restraint. Two independent measures were used to assess participants' restrictive eating. The 9-item Dietary Intent Scale (DIS; Stice, 1998) measures restricted eating patterns and dieting behavior. On items such as, "I take small helpings in an effort to control my weight," the women responded from 1 (*never*) to 5 (*always).* Total score is the mean of the items; higher scores indicate greater intention to restrict eating. Previous studies with female athletes have employed the DIS (e.g., Anderson et al., 2011; Carrigan, Petrie, & Anderson, 2015; Voelker et al., 2016). In a study with female adolescents (Greenleaf, Petrie, & Martin, 2015) Cronbach's alpha was .91; alpha from the current study was .93. Stice and Shaw (1994) reported a significant correlation (r = .92) with the Dutch Restrained Eating Scale (DRES).

The 10-item DRES (Van Strien et al., 1986) is a self-report assessment of behavioral restraint around food intake. Participants rate their frequency of use on a scale ranging from 1 (*never)* to 5 (*always)* on each item (e.g., "You watch exactly what you eat.") Total score is the mean, and higher scores indicate greater restraint with eating behaviors. Stice (1998) provided information about the scale's validity and reliability. Research with NCAA athletes has employed the DRES (Anderson et al., 2011), and a Cronbach's alpha of .90 was found in a study of female adolescents (Greenleaf et al., 2015). Cronbach's alpha for the current study was .94.

Perceived pressures. The participants completed the 35-item Perceived Sociocultural Pressures Scale (PSPS; Stice & Agras, 1998), a self-report measure that assesses the pressures experienced to (1) lose weight, (2) have a thin body, (3) exercise, (4) be more attractive, (5) have the perfect body, (6) diet, and (7) change one's appearance. Within each domain (e.g., "I've felt pressure to lose weight or diet from my…"), participants used a scale that ranged from 1 (*never*) to 5 (*always*) to rate the pressure they experience from four different sources: female friends, family, teammates/coaches, and the media. Total score for each type of pressure is the mean of

the four sources; higher scores indicate more pressure. Alphas from the current study were .79 (lose weight), .79 (thin body), .84 (exercise), .88 (more attractive), .85 (perfect body), .86 (diet), and .89 (change appearance). Stice and colleagues (e.g., Stice & Agras, 1998; Stice, Shaw, & Nemeroff, 1998) have provided extensive information about the scale's validity.

Procedures

The university's institutional review board approved this study, and all participants signed informed consent forms prior to completing the surveys. Time 1 data were collected as part of a larger study funded by the NCAA, whose purpose was to examine the physical and psychological well-being of female collegiate athletes (see Anderson et al., 2011 for a detailed description of the methodology). The head coaches of Division I gymnastics and swimming/diving programs from universities across the United States were originally contacted to solicit the participation of their athletes; 26 participated. The coaches were first informed of the study by email; follow-up communications were carried out by phone and email. Coaches were informed of the NCAA grant and the purpose of the study, and requirements of participation were explained. At each participating university, coaches had to identify a contact person (e.g., athletic trainer) who would administer the surveys at their schools. Of the 26 programs who agreed to participate, athletic trainers, team managers, assistant coaches, and head coaches served in this role and were paid $150.00 for their assistance.

Prior to the first data collection, team contacts were emailed to schedule survey administration dates with the athletes. Subsequently, team contacts were mailed the exact number of surveys necessary for each given team, standardized instructions, and the researcher's contact information; follow-up phone calls were made to answer any questions. Time 1 data collection occurred during the last 2 weeks of February 2009 at which each athlete received an

unsealed envelope containing the consent form and survey questionnaire. Team contacts first read the instructions, and then the athletes signed consent forms. Participation was voluntary, though no athlete refused to complete the questionnaires. Survey packets were completed anonymously (i.e., athletes did not put their names on the questionnaires), though each were coded by number so it could be matched to the questionnaires completed at Time 2; team contacts left the area so the athletes could respond in private.

We collected Time 2 data during 2015, which represented a six-year time span from when Time 1 data were collected. Time 2 data was funded by a new, separate NCAA grant whose purpose was to support research examining the challenges female athletes face during retirement from college sports. To obtain current contact information for the retired athletes, the researchers contacted previous coaching staffs, athletic departments, sports information directors, alumni networks, and teammates of the athletes who participated at Time 1. Based on this information, the retired athletes were initially contacted via email to request participation; follow-up contact was made through email and telephone as needed. Data collection occurred through online survey participation, in which the participants first viewed an informed consent agreement and digitally consented to participate prior to completing the questionnaires. Participation was voluntary and the retired athletes provided no current identifying information (e.g., name). They did, however, enter a unique identifier into the website that allowed the researchers to match their Time 2 responses to their Time 1 data. The athletes were offered a $25.00 online gift certificate as compensation for their participation.

Data Analysis

Although 325 athletes participated at Time 1 and provided complete data, 108 did not participate at Time 2 as a result of being unable to be contacted, not responding to requests to

participate, or providing incomplete data. Thus, analyses in this study are based on the 217 athletes (response rate = 66.8%) who provided data at both collection times.

Research question 1. Change in eating disorder classification over time, based on QEDD responses, will be examined through cross-tabulations and chisquare analyses. Further, all athletes' classifications from Time 1 will be examined in relation to their Time 2 classification to determine the extent to which movement occurred between eating disorder groups. Change in specific pathogenic weight control behaviors, based on the 7 items from the BULIT-R, also will be examined through cross-tabulations and chisquare analyses. Again, all athletes' responses from Time 1 will be examined in relation to their Time 2 responses to establish if pathogenic weight control behaviors changed over time and, if so, in what direction.

Research question 2. A logistic regression analysis will be used to examine the Time 1 psychosocial predictors of BMI, internalization, perceived pressures, negative affect, body dissatisfaction, and dietary restraint in relation to Time 2 QEDD classification (i.e., asymptomatic or symptomatic). The symptomatic classification will consist of the combination of clinical and subclinical eating disordered groups. Statistical assumptions will be examined, including multicollinearity of the predictor variables and the outcome variables' distributional properties (i.e., skewness, kurtosis, outliers). Sensitivity, specificity, and positive and negative predictive values of the model will be examined as well.

REFERENCES

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Washington, DC: Author

Anderson, C., & Petrie, T. (2012). Prevalence of disordered eating and pathogenic weight control behaviors among NCAA Division I female collegiate gymnasts and swimmers. *Research Quarterly for Exercise and Sport, 83,* 120-124. Retrieved from https://libproxy.library.unt.edu/login?url=http://search.proquest.com/docview/934468688?accountid=7113

Anderson, C. M., Petrie, T. A., & Neumann, C. S. (2011). Psychosocial correlates of bulimic symptoms among NCAA Division-I female collegiate gymnasts and swimmers/divers. *Journal of Sport & Exercise Psychology, 33*, 483-505. doi: 10.1123/jsep.33.4.483

Anderson, C. M., Petrie, T. A., & Neumann, C. S. (2012). Effects of sport pressures on female collegiate athletes: A preliminary longitudinal investigation. *Sport, Exercise, and Performance Psychology, 1*, 120-134. doi:10.1037/a0026587

Andrés, A., & Saldaña, C. (2014). Body dissatisfaction and dietary restraint influence binge eating behavior. *Nutrition Research, 34*, 944-950. doi:10.1016/j.nutres.2014.09.003

Arthur-Cameselle, J. N., & Quartromoni, P. A. (2010). Factors related to the onset of eating disorders reported by female collegiate athletes. *Applied Research, 15,* 1-17.

Beals, K. A. (2000). Subclinical eating disorders in female athletes. *Journal of Physical Education, Recreation & Dance, 71*, 23-29. Retrieved from http://search.proquest.com/docview/215762811?accountid=7113

Beals, K. A., & Manore, M. M. (2002). Disorders of the female athlete triad among collegiate athletes. *International Journal of Sport Nutrition and Exercise Metabolism, 12,* 281-293.

Beals, K. A., & Manore, M. M. (1998). Nutritional status of female athletes with subclinical eating disorders. *Journal of the American Dietetic Association, 96,* 419-425,

Brannan, M., Petrie T. A., Greenleaf, C., Reel, J., & Carter, J. (2009). The relationship between body dissatisfaction and bulimic symptoms in female collegiate athletes. *Journal of Clinical Sport Psychology, 3*, 103-126. doi: 10.1123/jcsp.3.2.103

Carrigan, K. W., Petrie, T. A., & Anderson, C. M. (2015). To weigh or not to weigh? Relation to disordered eating attitudes behaviors among female collegiate athletes. *Journal of Sport & Exercise Psychology, 37*, 659-665. doi: 10.1123/jsep.2015-2016

Carter, J. E., & Rudd, N. A. (2005). Disordered eating assessment for college student-athletes. *Women in Sport & Physical Activity Journal, 14,* 62-71. Retrieved from http://search.proquest.com/docview/230704428?accountid=7113

Cohen, D. L., & Petrie, T. (2005). An examination of psychosocial correlates of disordered eating among undergraduate women. *Sex Roles, 52,* 29-42.

da Costa, N. F., Schtscherbyna, A., Soares, E. A., & Ribeiro, B. G. (2013). Disordered eating among adolescent female swimmers: Dietary, biochemical, and body composition factors. *Nutrition, 29,* 172-177. doi: 10.1016/j.nut.2012.06.007

de Bruin, A, Oudejans, R. D., Bakker, F. C., & Woertman, L. (2013). Contextual body image and athletes' disordered eating: The contribution of athletic body image to disordered eating in high performance women athletes. *European Eating Disorders Review, 19*(3), 201-215. doi:10.1002/erv.1112

Delinsky, S. S., & Wilson, G. T. (2008). Weight gain, dietary restraint, and disordered eating in the freshman year of college. *Eating Behaviors, 9,* 82-90. doi:10.1016/j.eatbeh.2007.06.001

Doughty, J. H., & Hausenblas, H. A. (2005). A longitudinal examination of disordered eating correlates in collegiate gymnasts. *Women in Sport & Physical Activity Journal, 14,* 52-61. Retrieved from http://search.proquest.com/docview/230675985?accountid=7113

Erpic, S. C., Wylleman, P., & Zupancic, M. (2004). The effect of athletic and non-athletic factors on the sports career termination process. *Psychology of Sport and Exercise, 5,* 45-59. doi: 10.1016/S1469-0292(02)00046-8

Fuller, R. D. (2014). Transition experiences out of intercollegiate athletics: A meta-synthesis. *The Qualitative Report, 19*(46), 1-15. Retrieved from https://libproxy.library.unt.edu/login?url=http://search.proquest.com/docview/1640459619?accountid=7113

Gomes, A. R., Martins, C., & Silva, L. (2011). Eating disordered behaviors in Portuguese athletes: The influence of personal, sport, and psychological variables. *European Eating Disorders Review, 19,* 190-200. doi: 10.1002/erv.1113.

Greenleaf, C. J., Petrie, T. A., Carter, J., & Reel, J. J. (2009). Female collegiate athletes: Prevalence of eating disorders and disordered eating behaviors. *Journal of American College Health, 57,* 489-496. doi: 10.3200/JACH.57.5.489-496.

Greenleaf, C., Petrie, T. A., & Martin, S. B. (2015). Biopsychosocial correlates of dietary intent in middle school girls. *Eating Behaviors, 18,* 143-146. doi:10.1016/j.eatbeh.2015.05.013

Greenleaf, C. J., Petrie, T. A., Reel, J. J., & Carter, J. (2010). Psychosocial risk factors of bulimic symptomatology among female athletes. *Journal of Clinical Sport Psychology, 4,* 177-190. doi: 10.1123/jcsp.4.3.177

Grove, J. R, Lavallee, D., & Gordon, S. (1997). Coping with retirement from sport: The influence of athletic identity. *Journal of Applied Sport Psychology, 9,* 191-203. doi: 10.1080/10413209708406481

Hausenblas, H., & Carron, A. (1999). Eating disorder indices and athletes: An integration. *Journal of Sport and Exercise Psychology, 21,* 230-258. doi: 10.1123/jsep.21.3.230

Hausenblaus, H., & Carron, A. (2002). Assessing eating disorder symptoms in sport groups: A critique with recommendations for future research. *International Sports Journal, 6,* 66-74. Retrieved from: https://www.researchgate.net/publication/285777302_Assessing_eating_disorder_symptoms_in_sport_groups_A_critique_with_recommendations_for_future_research

Holland, L. A., Bodell, L. P., & Keel, P. K. (2013). Psychological factors predict eating disorder onset and maintenance at 10-year follow-up. *European Eating Disorders Review, 21,* 405-410. doi: 10.1002/erv.2241

Hudson, J. I., Hiripi, E., Pope Jr., H. G., & Kessler, R. C. (2007). The prevalence and correlates of eating disorders in the National Comorbidity Survey-Replication. *Biological Psychiatry, 61,* 348-358. doi: 10.1016/j.biopsych.2006.03.040.

Javaras, K. N., et al. (2008). Co-occurrence of binge eating disorder with psychiatric and medical disorders. *The Journal of Clinical Psychiatry, 69,* 266-273.

Kato, K., Jeva, S., & Culpepper, D. (2011). Body image disturbances in NCAA division I and III female athletes. *The Sport Journal, 14,* pp. unpaginated. Retrieved from: http://thesportjournal.org/article/body-image-disturbances-in-ncaa-division-i-and-iii-female-athletes/

Kerr, G., & Dacyshyn, A. (2000). The retirement experience of elite, female gymnasts. *Applied Sport Psychology, 12,* 115-133. doi: 10.1080/10413200008404218

Krentz, E. M., & Warschburger, P. (2011). Sports-related correlates of disordered eating in aesthetic sports. *Psychology of Sport and Exercise, 12,* 375-382. doi:10.1016/j.psychsport.2011.03.004

Krentz, E. M. and Warschburger, P. (2013). A longitudinal investigation of sports-related risk factors for disordered eating in aesthetic sports. *Scandinavian Journal of Medicine & Science in Sports, 23,* 303–310. doi: 10.1111/j.1600-0838.2011.01380.x

Le Grange, D., Swanson, S. A., Crow, S. J., & Merikangas, K. R. (2012). Eating disorder not otherwise specified presentation in the US population. *International Journal of Eating Disorders, 45,* 711-718. doi: 10.1002/eat.22006

Lewinsohn, P. M., Striegel-Moore, R. H., & Seeley, J. R. (2000). Epidemiology and natural course of eating disorders in young women from adolescence to young adulthood. *Journal of the American Academy of Child & Adolescent Psychiatry, 39,* 1284-1292. doi:10.1097/00004583-200010000-00016

Martinsen M., Bahr, R, Borresen, R., Holme, I., Pensgaard, M., & Sundgot-Borgen, J. (2014). Preventing eating disorders among young elite athletes: A randomized controlled trial. Medicine & Science in Sports & Exercise, 46, 435-447. doi: 10.1249/MSS.0b013e3182a702fc

Martinsen M., Bratland-Sanda, S., Eriksson, A. K., & Sundgot-Borgen, J. (2010). Dieting to win or to be thin? A study of dieting and disordered eating among adolescent elite athletes and non-athlete controls. *British Journal of Sports Medicine, 44,* 70-76. doi:10.1136/bjsm.2009.068668

Mintz, L. B., & Betz, N. E. (1988). Prevalence and correlates of eating disordered behaviors among undergraduate women. *Journal of Counseling Psychology, 35,* 463-471. Retrieved from: https://www.researchgate.net/publication/232471316_Prevalence_and_Correlates_of_Eating_Disordered_Behaviors_Among_Undergraduate_Women

Mintz, L. B., O'Halloran, M. S., Mulholland, A. M., & Schneider, P. A. (1997). Questionnaire for eating disorder diagnoses: Reliability and validity of operationalizing DSM-IV criteria into a self-report format. *Journal of Counseling Psychology, 44,* 63-79. doi: 10.1037/0022-0167.44.1.63

Murray, S. B., & Anderson, L. K. (2015). Deconstructing "Atypical" eating disorders: An overview of emerging eating disorder phenotypes. *Current Psychiatry Reports, 17,* 86. doi: 10.1007/s11920-015-0624-7.

Papathomas A, Lavallee D. (2006). A Life History Analysis of a Male Athlete with an Eating Disorder. *Journal of Loss and Trauma, 11,* 143-179. doi: 10.1080/15325020500409192

Papathomas, A., & Lavallee, D. (2014). Self-starvation and the performance narrative in competitive sport. *Psychology of Sport and Exercise, 15,* 688-695. doi: 10.1016/j.psychsport.2013.10.014

Peck, L. D., & Lightsey, Jr., O. R. (2008). The eating disorders continuum, self-esteem, and perfectionism. *Journal of Counseling and Development, 86,* 184-192. doi: 10.1002/j.1556-6678.2008.tb00496.x

Petrie, T. (1993). Disordered eating in female collegiate gymnasts: Prevalence and personality/attitudinal correlates. *Journal of Sport and Exercise Psychology, 15,* 424-436. doi: 10.1123/jsep.15.4.424

Petrie, T., & Greenleaf, C. (2007). Eating disorders in sport: From theory to research to intervention. In G. Tenebaum & R. Eklund (Eds.), *Handbook of sport psychology* (pp. 352-378). Hoboken, NJ: John Wiley & Sons.

Petrie, T., & Greenleaf, C. (2012). Eating disorders in sport. In S. Murphy (Ed.), Oxford Handbook of Sport and Performance Psychology (pp. 635-659). New York: Oxford University Press.

Petrie, T., Greenleaf, C., Reel, J.R., & Carter, J.E. (2009a). An examination of psychosocial correlates of eating disorders among female collegiate athletes. *Research Quarterly for Exercise and Sport, 80,* 621-632. doi: 10.1080/02701367.2009.10599601

Petrie, T., Greenleaf, C., Reel, J.R., & Carter, J.E. (2009b). Personality and psychological factors as predictors of disordered eating among female collegiate athletes. *Eating Disorders, 17,* 302-321. Doi: 10.1080/10640260902991160

Petrie, T. A., & Stoever, S. (1993). The incidence of bulimia nervosa and pathogenic weight control behaviors in female gymnasts. *Research Quarterly for Exercise and Sport, 64,* 238-241. Retrieved from https://libproxy.library.unt.edu/login?url=http://search.proquest.com/docview/218489976?accountid=7113

Petrie, T. A., Tripp, M. M., & Harvey P. (2002). Factorial and construct validity of the body parts satisfaction scale-revised: An examination of minority and nonminority women. *Psychology of Women Quarterly, 26,* 213-221. doi: 10.1111/1471-6402.00060

Prather, H., Hunt, D., McKeon, K., Simpson, S., Meyer, E. B., Yemm, T., & Brophy, R. (2016). Are elite female soccer athletes at risk for disordered eating attitudes, menstrual dysfunction, and stress fractures? *The Journal of Injury, Function, and Rehabilitation, 8,* 208-213. doi: 10.1016/j.pmrj.2015.07.003.

Reel, J., Petrie, T. A., SooHoo, S., & Anderson, C. A. (2013). Weight pressures in sport: Examining the factor structure and incremental validity of the weight pressures in sport – females. *Eating Behaviors, 14,* 137-144. doi: 10.1016/j.eatbeh.2013.01.003

Reinking, M. F., & Alexander, L. E. (2005). Prevalence of Disordered-Eating Behaviors in Undergraduate Female Collegiate Athletes and Nonathletes. *Journal of Athletic Training, 40,* 47–51. Retrieved from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1088345/

Sanford-Martens, T. C., Davidson, M. M., Oksana, F. Y., Martens, M. P., Hinton, P., & Beck N. (2005). Clinical and subclinical eating diosrders: An examination in college athletes. *Journal of Applied Sport Psychology, 17,* 79-86. doi: 10.1080/10413200590907586.

Simon, J. E., & Docherty, C. L. (2014). Current health-related quality of life is lower in former division I collegiate athletes than in non-collegiate athletes. *American Journal of Sports Medicine, 42,* 423-429. doi: 10.1177/0363546513510393

Smink, F., van Hoeken, D., & Hoek, H. W. (2012). Epidemiology of eating disorders: Incidence, prevalence and mortality. *Current Psychiatry Reports, 14,* 406-414. doi: 10.1007/s11920-012-0282-y

Smink, F., van Hoeken, D., Oldehinkel, A. J., & Hoek, H. W. (2014). Prevalence and severity of DSM-5 eating disorders in a community cohort of adolescents. *International Journal of Eating Disorders, 47,* 610-619. doi: 10.1002/eat.22316.

Smolak, L., Murnen, S. K. and Ruble, A. E. (2000), Female athletes and eating problems: A meta-analysis. *International Journal of Eating Disorders*, *27*, 371–380. doi: 10.1002/(SICI)1098-108X(200005)27:4<371::AID-EAT1>3.0.CO;2-Y

Soubliere, D., & Gitimu, P. N. (2012). Female athletes and eating disorders. *The Sport Journal, 15*, unpaginated. Retrieved from: https://www.questia.com/library/journal/1G1-322563601/female-athletes-and-eating-disorders

Spoor, S. T.P., Stice, E., Bekker, M. H.J., Van Strien, T., Croon, M. A. & Van Heck, G. L. (2006). Relations between dietary restraint, depressive symptoms, and binge eating: A longitudinal study. *International Journal of Eating Disorders*, *39*, 700–707. doi:10.1002/eat.20283

Stephan, Y. (2003). Repercussions of transition out of elite sport on subjective well-being: A one-year study. *Journal of Applied Sport Psychology, 15*, 354-371. doi: 10.1080/714044202

Stice, E. (1998). Relations of restraint and negative affect to bulimic pathology: A longitudinal test of three competing models. *International Journal Of Eating Disorders*, *23*, 243-260. doi: 10.1002/(SICI)1098-108X(199804)23:3<243::AID-EAT2>3.0.CO;2-J

Stice, E. (2002). Risk and maintenance factors for eating pathology: A meta-analytic review.*Psychological Bulletin*, *128*(5), 825-848. doi:10.1037/0033-2909.128.5.825

Stice, E., & Agras, W. S. (1998). Predicting onset and cessation of bulimic behaviors during adolescence: A longitudinal grouping analysis. *Behavior Therapy, 29*, 257-276. doi: 10.1016/S0005-7894(98)80006-3

Stice, E., Davis, K., Miller, N. P., & Marti, C. N. (2008). Fasting increases risk for onset of binge eating and bulimic pathology: A 5-year prospective study. *Journal Of Abnormal Psychology*, *117*, 941-946. doi:10.1037/a0013644

Stice, E., Marti, C. N., & Rohde, P. (2013). Prevalence, incidence, impairment, and course of the proposed DSM-5 eating disorder diagnoses in an 8-year prospective community study of young women. *Journal of Abnormal Psychology*, *122*, 445-457. doi: 10.1037/a0030679

Stice, E., & Shaw, H.E. (1994). Adverse effects of the media portrayed thin-ideal of women and linkages to bulimic symptomatology. *Journal of Social and Clinical Psychology,13*, 288–308. doi: 10.1521/jscp.1994.13.3.288

Stice, E., Shaw, H.E., & Nemeroff, C. (1998). Dual-pathway model of bulimia nervosa: Longitudinal support for dietary restraint and affect-regulation mechanisms. *Journal of Social and Clinical Psychology, 17*, 129–149. doi: 10.1521/jscp.1998.17.2.129

Stirling, A. E., Cruz, L. C., Kerr, G. A. (2012). Influence of retirement on body satisfaction and weight control behaviors: Perceptions of elite rhythmic gymnasts. *Journal of Applied Sport Psychology, 24*, 129-143. doi: 10.1080/10413200.2011.603718

Sundgot-Borgen, J. (1993). Prevalence of eating disorders in elite female athletes. *International Journal of Sport Nutrition, 3,* 29-40. doi: 10.1097/00005768-199905001-01465

Sundgot-Borgen, J., & Torstveit, M. K. (2004). Prevalence of eating disorders in elite athletes is higher than in the general population. *Clinical Journal of Sport Medicine, 14,* 25-32. doi: 10.1111/j.1600-0838.2007.00657.x

Sundgot-Borgen, J., & Torstveit, M. K. (2010). Aspects of disordered eating continuum in elite high-intensity sports. *Scandinavian Journal of Medicine & Science in Sports, 20,* 112-121. doi: 10.1111/j.1600-0838.2010.01190.x

Taylor, J., & Ogilvie, B. C. (1994). A conceptual model of adaptation to retirement among athletes. *Journal of Applied Sport Psychology, 6,* 1-20. doi: 10.1080/10413209408406462

Thelen, M.H., Mintz, L., & Vander Wal, J. (1996). The Bulimia Test-Revised: Validation with DSM criteria for bulimia nervosa. *Psychological Assessment, 8,* 219–221. Retrieved from: http://psycnet.apa.org/index.cfm?fa=buy.optionToBuy&id=1996-00455-015

Thompson, A. J., Petrie, T. A., & Anderson, C. (2017). Eating disorders and weight control behaviors change over a collegiate sport season. *Journal of Science and Medicine in Sport*. doi: 10.1016/j.jsams.2017.03.005

Thompson, J. K., van den Berg, P., Roehrig, M., Guarda, A. S., & Heinberg, L. J. (2004). The sociocultural attitudes towards appearance scale-3 (SATAQ-3): Development and validation. *The International Journal of Eating Disorders, 35,* 293-304. doi: 10.1002/eat.10257

Thompson, R. A., & Sherman, R. T. (2010). *Eating Disorders in Sport*. New York, NY: Routledge.

Thompson, R. A., & Sherman, R. T. (2014). Reflections on athletes and eating disorders. *Psychology of Sport and Exercise, 15*, 729-734. doi: 10.1016/j.psychsport.2014.06.005

Torres-McGehee, T. M., Monsma, E. V., Dompier, T. P., & Washburn, S. A. (2012). Eating disorder risk and the role of clothing in collegiate cheerleaders' body images. *Journal of Athletic Training, 47,* 541-548. doi: 10.4085/1062-6050-47.5.03

Torsveit, M. K., Rosenvinge, J. H., & Sundgot-Borgen, J. (2008). Prevalence of eating disorders and the predictive power of risk models in female elite athletes: A controlled study. *Scandinavian Journal of Medicine & Science in Sports, 18,* 108-118. doi: 10.1111/j.1600-0838.2007.00657.x

Treasure, J., Claudino, A. M., & Zucker, N. (2010). Eating disorders. *The Lancet, 375*(9714), 583-93. Retrieved from http://search.proquest.com/docview/199059169?accountid=7113

Tylka, T. L. and Subich, L. M. (2002), Exploring Young Women's Perceptions of the Effectiveness and Safety of Maladaptive Weight Control Techniques. *Journal of Counseling & Development, 80,* 101–110. doi: 10.1002/j.1556-6678.2002.tb00172.x

Tylka, T. L., & Wilcox, J. A. (2006). Are intuitive eating and eating disorder symptomatology opposite poles of the same construct?. *Journal Of Counseling Psychology*, *53*(4), 474-485. doi:10.1037/0022-0167.53.4.474

Voelker, D. K., Gould, D., & Reel, J. J. (2014). Prevalence and correlates of disordered eating in female figure skaters. *Psychology of Sport and Exercise, 15,* 696-704. doi:10.1016/j.psychsport.2013.12.002

Voelker, D. K., Petrie, T. A., Neumann, C. S., & Anderson, C. M. (2016). Psychosocial factors as longitudinal predictors of bulimic symptomatology among female collegiate athletes. *Psychology of Sport and Exercise, 26,* 123-129. doi: 10.1016/j.psychsport.2016.06.009

Walsh, T. (2009). Report of the DSM-5 eating disorders work group. Arlington, VA: American Psychiatric Association.

Warren, C. S., Gleaves, D. H., & Rakhkovskaya, L. M. (2013). Score reliability and factor similarity of the sociocultural attitudes towards appearance questionnaire-3 (SATAQ-3) among four ethnic groups. *Journal of Eating Disorders, 1,* 1-14. doi:10.1186/2050-2974-1-14

Warriner, K., & Lavallee, D. (2008). The retirement experiences of elite female gymnasts: Self identity and the physical self. *Journal of Applied Sport Psychology, 20,* 301-317. doi: 10.1080/10413200801998564

Watson, D., & Clark, L. A. (1992). Affects separable and inseparable: On the hierarchical arrangement of the negative affects. *Journal Of Personality And Social Psychology*,*62*, 489-505. doi:10.1037/0022-3514.62.3.489

Werner, A., Thiel, A., Schneider, S., Mayer, J., Giel, K. E., & Zipfel, S. (2013). Weight-control behavior and weight-concerns in young elite athletes – a systematic review. *Journal of Eating Disorders, 18,* 1-13. 10.1186/2050-2974-1-18

Williams, P. L., Sargent, R. G., & Durstine, L. J. (2003). Prevalence of subclinical eating disorders in collegiate female athletes. *Women in Sport & Physical Activity Journal, 12*, 127. Retrieved from http://search.proquest.com/docview/230705411?accountid=7113

Winston, A. P. (2004). Eating disorders: Physical aspects. *Women's Health Medicine, 1,* 17-21. doi: 10.1383/wohm.1.1.17.55414